SKYWAYS

MILITARY ★ CIVIL ★ COMMERCIAL AVIATION

Illinois U Library

USAF's Fighting F-86

page 14

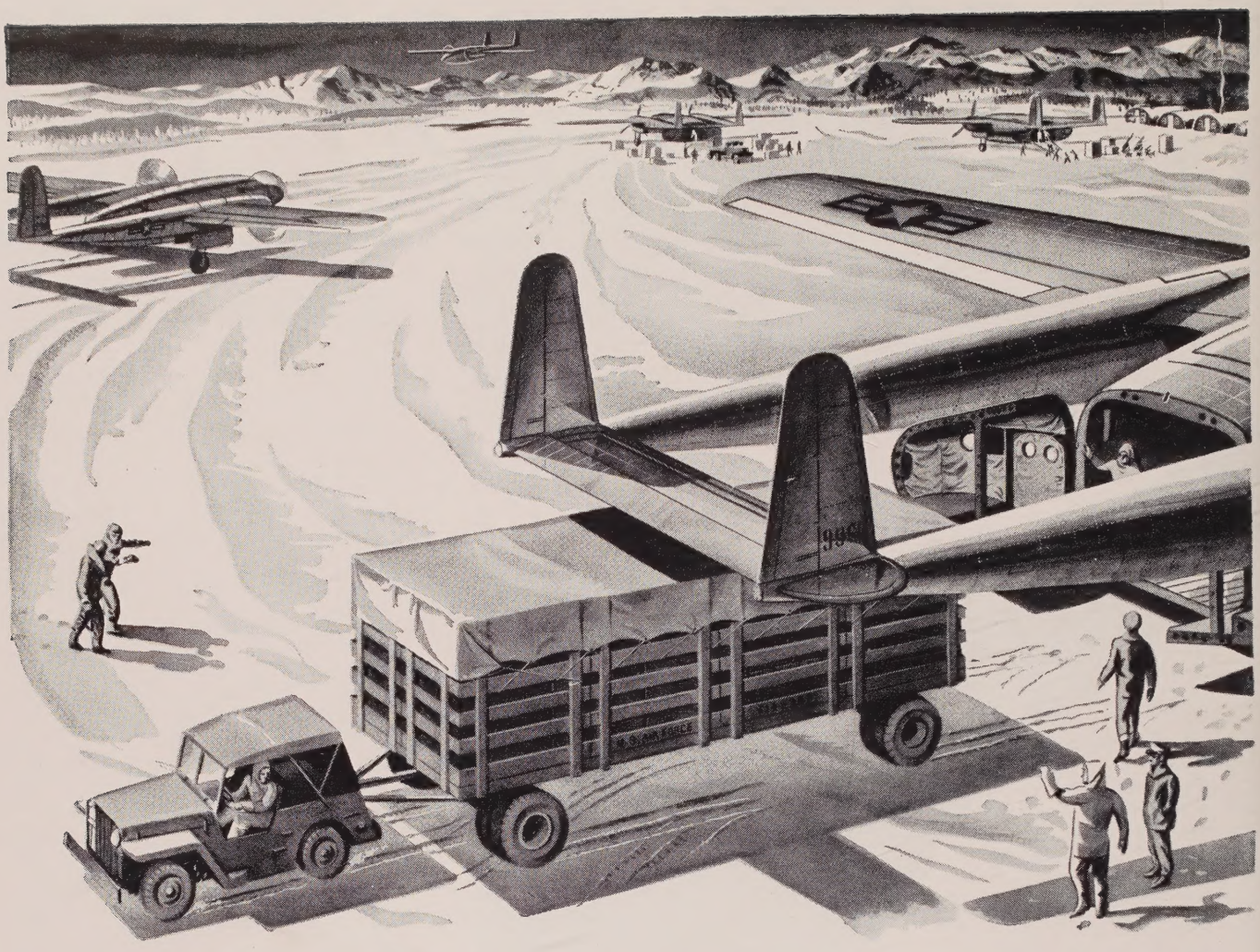
ts on the Gages

page 24

ot's Report...

Midget Racer, page 18

9K-485 10-50
CHICAGO UNDERGRADUATE
DIVISION
NAVY PIER
CHICAGO 11 ILL



DELIVERY—

Via the Air Route

The Military Air Transport Service (MATS) contributes to the mobility of the Armed Forces by airlifting cargo and personnel *whenever* and *wherever* needed to fulfill national military requirements.

Fairchild C-119 Packets, soon to be flying for the Military Air Transport Service, help fulfill this vital air transportation mission. Capable of carrying 64 passengers or 10 tons of cargo, this twin-engine transport and cargo plane has the *versatility* to accomplish numerous types of operations required via the MATS Air Route.

The C-119's unique rear loading at truck-bed height allows for rapid handling of cargo, eliminating the necessity for extra ground handling equipment. Airplane engines and parts, bulky communication equipment, vehicles, tanks and field kitchens are some of the many military items the Fairchild C-119 carries with ease. In addition to its utility as a cargo plane, the Packet is equally efficient for air-evacuation, air-sea rescue, and personnel transport.

The C-119 is one of a series of Fairchild transport planes which will continue to play a versatile role in the operations of the world wide Military Air Transport Service.

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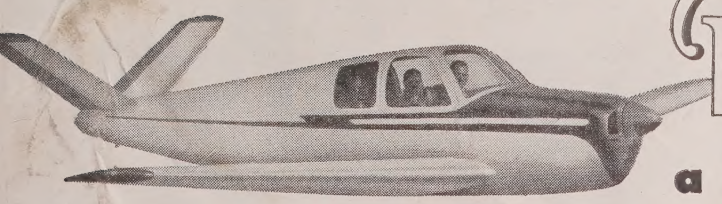
FAIRCHILD *Aircraft Division*

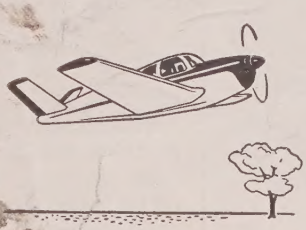
HAGERSTOWN, MARYLAND

Features like these make Beechcraft a better buy than ever!

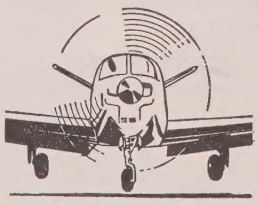


New Beechcraft propeller

Increased take-off horsepower



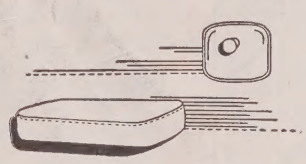
Faster-action landing gear



Increased, faster flap travel

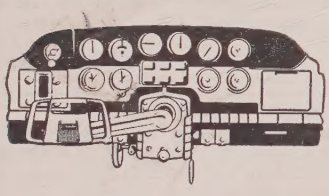
New upholstery combinations

Three new map pockets

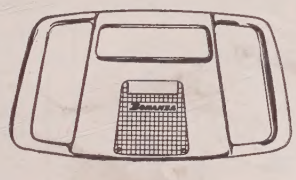


Four new arm rests

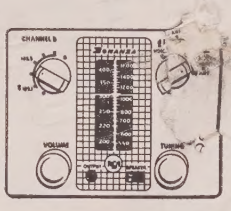
New exterior paint design



New instrument panel design



Safety-type control wheel



New radio with VHF channels

Access door for oil tank

It has no equal in performance, speed, economy, strength, safety, style and comfort!

The new B35 Beechcraft Bonanza exceeds all promises for a speed-with-economy plane that's roomy, comfortable and easy to fly! New performance features at moderate horsepower add to its versatility and safety, hold operating and maintenance costs at a *business economy* level! New operating conveniences and luxury appointments plus scores of refinements call for a personal inspection because there's room here to show only a few. See it! Get all the facts! You'll agree this greater-than-ever Beechcraft Bonanza is a better-than-ever value!

Top speed, 184 mph
Cruising speed, 170 mph
Range, 750 miles
Fuel economy, 9.5 gph

Get all the facts! There are hundreds more — about the extra advantages of the new Model B35 Beechcraft Bonanza. Check with your nearest Beechcraft distributor or dealer, or write for complete information on your company letterhead to Beech Aircraft Corporation, Wichita, Kansas.

Beechcraft BONANZA

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

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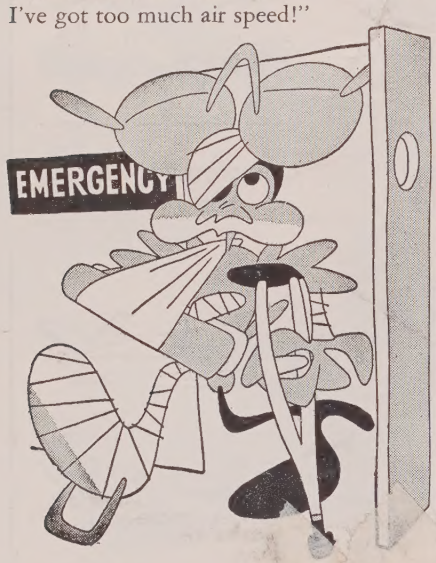
ne Birdmen's Perch

Famous last words: "I won't stall out, I've got too much air speed!"



You won't hear a crack like th... Air Force or Navy trained flyers, be... they know you *can* stall at high speed.

But—there are still plenty of flightplans pilots who figure that the phenomenon is restricted to high-speed planes.

Actually, you can hit a high-speed stall in any plane. This maneuver is seldom demonstrated in civilian flying because it's plenty rough on both plane and pilot.

Always remember: at a given air speed, you can curve the flight path of a given plane only so sharply. Try to exceed your plane's limitations and—tut-tut, such a promising pilot, too!

AND NOW . . .

Leave us have a moment of silence for those embattled pilots who haven't yet discovered the wonders of Gulfpride Aviation Oil—Series D!

Listen—you can hear the laborings of their tired engines on the way to overhauls.

What a pity some pilots don't know that Gulfpride Aviation Oil—Series D—is the world's finest detergent dispersant oil for horizontally opposed engines. It's the only aviation oil put through Gulf's exclusive Alchlor Process to remove extra carbon and sludge formers.

How sad these same pilots don't realize that Gulfpride Aviation Oil—Series D—could increase their periods between overhauls up to 100%!

Pass the crying towel, Maggie.

LITTLE KNOWN FACTS DEPT.

Ah—but there's good news at LaGuardia tonight! If the lights burn a little later than usual, if a few scheduled flights fail to materialize, blame it all on A. P. Magner, Asst. Chief Dispatcher for Pan Am.

For his L.K.F. (with proof, mind you), this august personage has earned the most honorable Commission of Perch Pilot (br)—"bottom rung," that is.

Now, A. P., if you'll just forget your ecstasy for a minute and come down from the chandelier, we'll make with your L.K.F.A.W.K.P. (For youse guys what

can read: Little Known Facts About Well Known Planes.)

"Due to fuel consumption, the Boeing Stratocruiser loses weight in flight at a rate equal to one adult passenger disembarking every 3 minutes."

Your Commission is en route, A. P., trot out the gilt-edge frame.

Hey, you, the guy weeping in his beer . . .

Don't remain unsung forever. Send your Little Known Facts About Well Known Planes—with PROOF—to this address:

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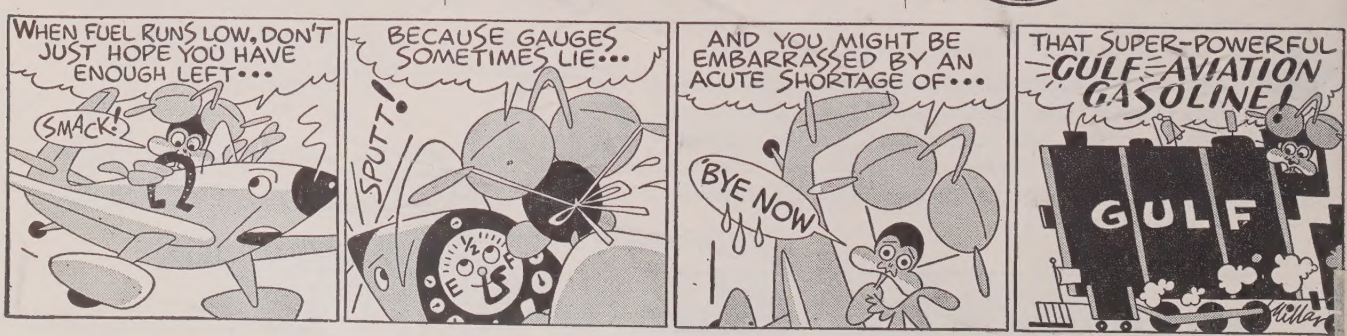
WHEN FUEL RUNS LOW, DON'T JUST HOPE YOU HAVE ENOUGH LEFT...
SMACK!
BECAUSE GAUGES SOMETIMES LIE...
SPUTT!
AND YOU MIGHT BE EMBARRASSED BY AN ACUTE SHORTAGE OF...
BYE NOW
THAT SUPER-POWERFUL GULF AVIATION GASOLINE!
GULF

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Northrop student engineers designed and built these pulse-jet engines as a typical practical project assigned as part of the Institute's up-to-the-minute instruction in principles and operation of latest types of aircraft power plants.

Aeronautical Engineers are pushing ever upward the curve of aircraft performance and air transportation. *Aviation* depends on engineers... and their profession... for its constant and amazing achievements and growth. A career in *Aeronautical Engineering*—the key division of *Aviation*—can be *YOUR personal plan for progress.*

Here is a career of lifelong adventure... *for YOU*... in the great *Air Age*. Besides fascinating work, you enjoy these rich rewards—good pay from the start... wide-open opportunity for quick advancement... putting your own original ideas into action... the security of a big, growing industry. And in *Aeronautical Engineering*, whether you are *creative* or *practical* by nature, there is a place for your particular talents and ability.

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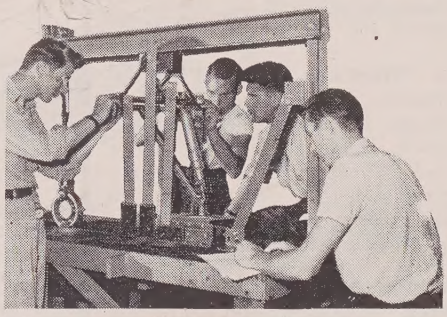
FOR THIS CATALOG—SEND COUPON NOW



Experience duplicating every-day engineering duties in aircraft plants is an important advantage of NAI training. These students are testing a nose wheel installation for braking effects, in the Institute "test lab."

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Coming Up... in SKYWAYS

With your airplane's skis long since put away, and the springtime check completed, now is the time to wheel the sky-baby out of the hangar and point her nose back up into the sky that's her natural home. If you're planning a cross-country to work the kinks out of your flying hand, take along a copy of SKYWAYS and when you land at that airport down the road a bit, crack this airmen's magazine for good reading.

- **Here's the line-up for May:**

- **"Pilot's Report:** New 1950 Bonanza," *by Don Downie.* It has always been a good airplane, but this new model is even better. Ride with your test pilot as he compares this new 1950 *Bonanza* with last year's model. See how this new Beech *Bonanza* performs in comparison with your own airplane.

- **"Special Mission Squadron, USAFE,"** *by M/Sgt. Patrick Moriarity.* There's an Air Force outfit in Europe that does everything . . . even in the face of bad weather. Among its many missions have been air trips into Russia. Read this article for a behind-the-scenes view of air operations of top priority, no matter the weather or destination.

- **"What's in a Trade?"** *by Ed Hoadley.* If you're contemplating a change in airplanes, go over this article before you sign up for a trade. There are many ways for a plane owner to get a rooking in this trade business, and the author of this one writes from experience.

- **"Alaska to Norway — Non-Stop,"** *by Col. Bernt Balchen.* For the first time in aviation history, a C-54 was flown non-stop from Alaska to the mainland of Europe. In this one, famed polar flyer, Col. Bernt Balchen, commander of Alaskan Air Command's 10th Rescue Squadron, tells of this record flight that was made on two-days' notice.

- **"Strike Fighter—F-90."** Here's a test pilot's report on the new Lockheed twin-jet sweptwing penetration fighter destined to be real menace to enemy's big bombers.

These articles and more will come to you in SKYWAYS. Get your

May Issue

On sale at newsstand April 7

SKYWAYS

Cover: Lockheed F-90

Sky-High Sabre Dance . . . . . George Welch 14
F-86's Test Pilot reports in detail on the Air Force's jet Sabre

New Jet Fighter for the AF 17
The YF-93A is the Air Force's newest high-speed jet penetration fighter

Pilot's Report: Cosmic Wind . . . . . "Fish" Salmon 18
A midget-racer pilot tells how to fly these small speedy airplanes

Hell-Bent for Rescue . . . . . Terry Kay 20
Flight "D" combs the sea to rescue the crew of a downed B-29

Want to Break a Record! . . . . . Norman Marsh 22
Here's what happens when a pilot gets a yen to set a new X-C record

Jets on the Gages . . . . . Bob Arentz 24
The F-80 boys in Alaska train their sights on "invincible" big bombers

The Cyclone—Jet Lightplane . . . . . L. M. Horton 28
France introduces to the U.S. the first jet-propelled lightplane

Microwave Lighthouse . . . . . Col. N. F. Silsbee 30
Precision omni-range may break up traffic congestion problem at airports

Test Pilot Training . . . . . Lt. (jg) Hank Searls 32
Air Force pilots, Marine Corps and even RAF boys go to the Navy school

Never Get Lost . . . . . Ben Robin 34
A good orientation system has brought many a pilot home safely

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A mouse can be a rat if it gets into your plane's wings

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ALFRED B. BENNETT . Advertising Manager

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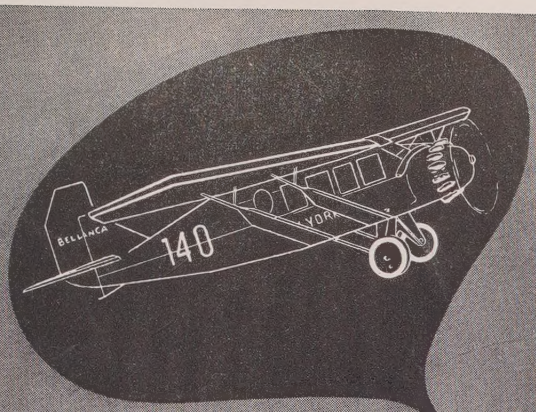
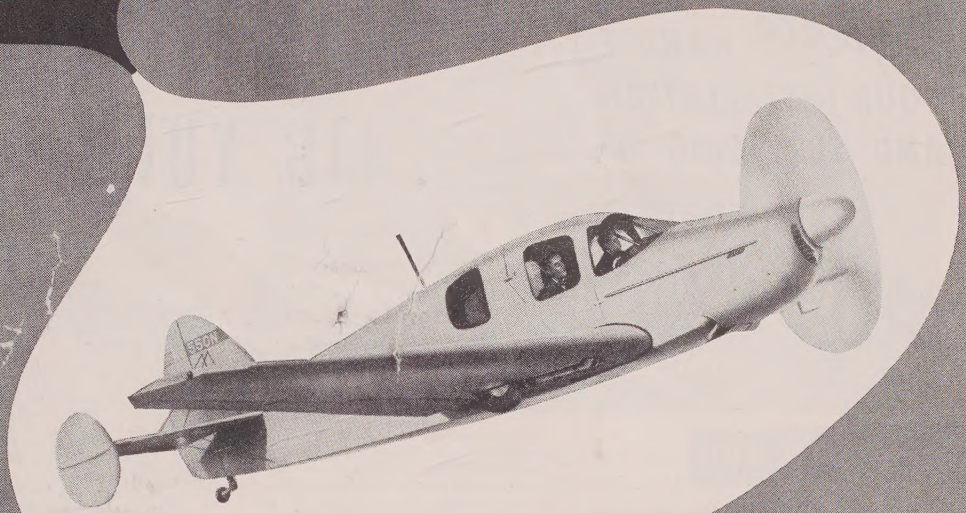


IN '27 IT WAS THE "COLUMBIA"



TODAY IT'S THE

Cruisemaster

Twenty-three years and thousands of airplanes ago, Bellanca triumphed with the "Columbia", made famous by Chamberlin and Levine in their flight to Eisleben, Germany. Today, Bellanca still holds the spotlight with the outstanding "Cruisemaster" —*the* executive airplane of 1950! The Bellanca Cruisemaster introduces sensational new safety features . . . new wide windows . . . new wide doors . . . new soundproofing . . . luxurious interior designed by Joanne Seybold!

The new safety features and the low landing speed of 43 miles per hour make the Cruisemaster the ideal airplane for either the novice or the veteran—for business or pleasure—for short field operation or spacious airports. A cross country cruising speed of 180 miles per hour makes distant points only a few hours away.

BELLANCA CRUISEMASTERS ARE DELIVERED WITH THIS STANDARD EQUIPMENT AND ARE AVAILABLE IN SEVERAL PLEASING INTERIOR COLOR COMBINATIONS.

Lycoming 190 engine—2-way VHF, plus the low frequency band—automatic hydraulic landing gear and flap mechanism —full controllable Hartzell Propellor—navigation lights—standard edge instrument lights—spacious baggage compartment—chrome grill and strips.

PERFORMANCE

Stalling speed 43 MPH—Cruising speed 180 MPH from sea level to 8500 feet at full gross load. (This Lycoming 0-435A engine develops 190 H.P. at 2550 RPM for continuous operation without limitation.)

WEIGHTS

Empty 1525, Gross 2600, Useful Load 1075, Baggage 198 lbs.

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AIR YOUR VIEWS

More BT-13

Gentlemen:
Sgt. R. P. Farmer is right concerning the speed of a BT-13. It will cruise at 135 mph. . . and some will cruise even faster than that. I have a friend who owns one and he claims his will do 142. But . . . it takes an oil well in Texas to fly one.

O. L. LINGO

Nason, Illinois

Thank you for the word, Mr. Lingo. By the way, our Air Force friend who slipped us the wrong information on the speed of the BT-13 has requested duty aboard a space ship where, he hopes, he can escape the barrage of mail his "error" produced.—ED.

Another Two-Holer

Gentlemen:
While reading the January issue, I noted the article and picture concerning Eugene Biglow and the prop with the holes. My first experience with a prop like that was during the war. It was on an AT-6 trainer in #6B.F.T.S. located at Ponca City, Oklahoma. We all flew the ship and its prop had two nice holes in it. But the only time it whistled very noisily was at 1100 or 1200 rpm. I now own a BT-13 and it has a prop just like it. This makes two such ships with "holed" props that I've been around, and the point is I'd like to know the real truth about them. I've heard a lot of stories. Is the story you told right?

EARL C. HENRY

Oklahoma City, Oklahoma

We can only vouch for the BT-13 Eugene Biglow reports on. According to the log book that came with the ship when it was purchased from War Surplus, the first hole was the result of a machine gun that went out of synchronization. That's the notation in the log book.—ED.

Jets Aren't Simple

Gentlemen:
I wish to call attention to Capt. Creed's article "Jets Are Simple," in the December issue. As a member of the 66th Fighter Squadron, Elmendorf AFB, Anchorage, Alaska, I've had an appreciable amount of experience in the maintenance of both the F-51 and the F-80. I don't believe one would find an oil diluation switch or an inertia starter switch in an F-80.

I also take objection to the statement that the fuel system of the F-80 is comparable in simplicity only to that of a *Cub* trainer. As a civilian pilot I have had considerable experience with a *Cub*. It's fuel system consists of a gasoline tank, a gasoline line, and a carburetor. To name just the major components of the F-80 system would require too much space and time right now.

Y. G. ROWLAND

Rome, N. Y.

We asked Capt. Creed about your letter, Mr. Rowland, and this was his reply: "Reader Rowland is correct about the F-80 not having an oil dilution system; however, both the RF and the F-80A have an inertia starter for 'air starts' only, as well as the regular starter for ground starts. Reader Rowland is speaking strictly from the maintenance point of view when he disputes the simplicity of the F-80's fuel system. Granted there are more fuel lines, valves, etc., in the F-80 than in a Cub, *but the F-80 pilot has merely to flip on one bank which controls four switches, and one other switch to insure the plane's getting fuel. These switches should be turned off as the different tanks empty themselves, but failure to do so will result in nothing more serious than a burned-out booster pump. But here again, changing booster pumps is not the way the maintenance people like to spend their time. (signed) Richard L. Creed, Capt. USAF."*—ED.

XBT2C

Gentlemen:
In Skyways for February, 1950, (Air Your Views), you state that Curtiss Wright officials said they had never built an XBT2C. This is wrong. I know because I flew the last one out of the Naval Test Center at Patuxent River, Maryland, on November 6, 1947. The Bureau number of this plane was 50888. There were, I believe, eight built by Curtiss Wright.

The BT-2C was an Army basic trainer model 2 modification C. The XBT2C-1 was the Navy designation for an experimental torpedo bomber. "X" for experimental. "B" for bomber. "T" for torpedo, "2" for second "BT"-type built by the manufacturer, "C" for Curtiss, and "1" for the modification number.

Please pass on the difference in Army . . . ooops . . pardon me, Air Force and Navy aircraft designations

ALAN R. COTARIU
Lt. (JG), USN

Patuxent River, Md.

We're indebted to you, Lt. Cotariu, and we'll pass on your information to C-W, too. Here are the differences in designations by AF and Navy:

AIR FORCE	*NAVY*
A—Amphibian	*A—Attack*
B—Bomber	*F—Fighter*
C—Cargo/Transport	*P—Patrol*
F—Fighter	*O—Observation*
G—Glider	*R—Transport*
H—Helicopter	*U—Utility*
L—Liaison	*T—Trainer*
Q—Target & Drone	*G—Glider*
R—Reconnaissance	
S—Search & Rescue	
T—Trainer	
X—Special Research	

The Navy designated its rotary wing aircraft with the symbol "H" with the following additional qualifying functional letters: HH—Search and Rescue; HO—Observation; HT—Training; HR—Transport; and HU—Utility.—ED.

Eager Beaver

Gentlemen:
I found the Cessna 195 Pilot's Report to be very interesting. For patriotic reasons, however, I would like to mention the Canadian-built *Beaver*. It would be even more adaptable to the flight conditions encountered by the 10th Rescue Squadron in Alaska. The *Beaver* is a proven "Bush" aircraft.

F. B. LAUSANNE

Wolfville, Nova Scotia

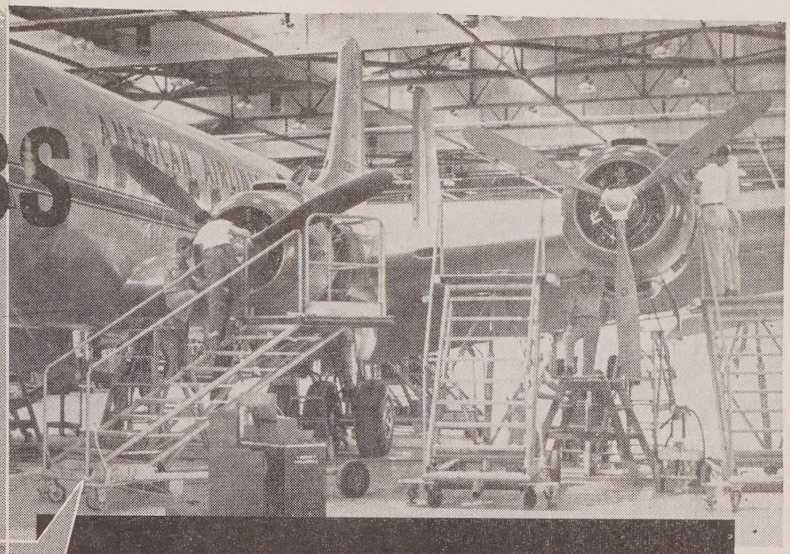
Pressure Pattern Flying

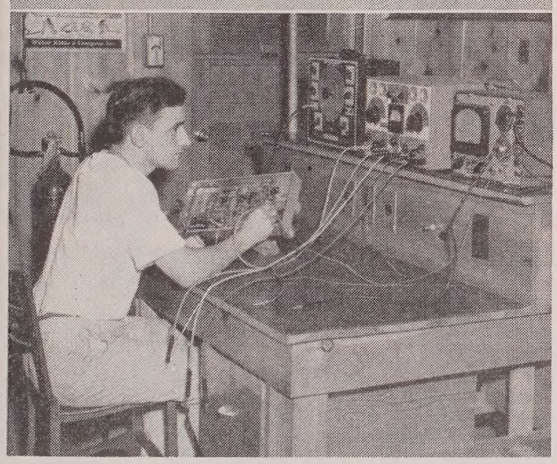
Gentlemen:
During the past year I took a course in navigation in the RCAF, and one method taught was pressure pattern flying. The article by Bob Mudge in February issue was very interesting, but I think he made one small error. The wind does not follow exactly the contours of the isobars on the surface synoptic chart, but rather blows at a slight angle to them. Around the center of a low the winds tend to move outward away from the low, while the condition at the center of a high is the reverse. This veer or backing exists up to an altitude of 1500 feet.

K. A. STEVENS

Flushing, L. I., N. Y.

ONE OF THESE JOBS CAN BE *Yours-*





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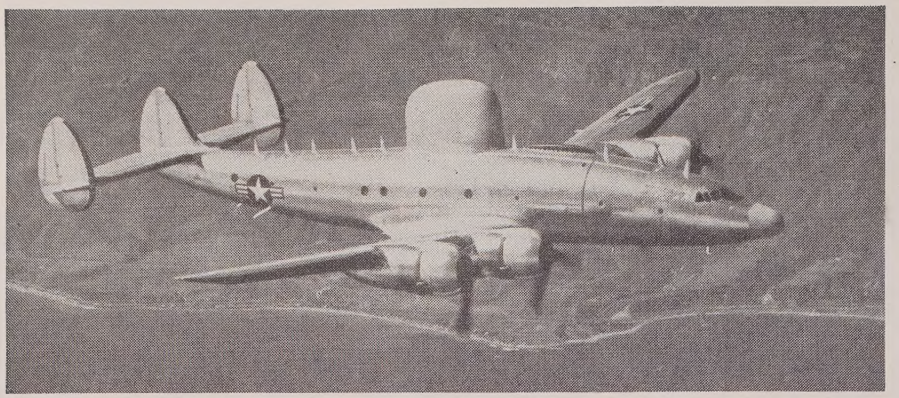


NAVY'S PO-1W is a specially modified *Constellation* which is to be used for testing radar

MILITARY AVIATION

BOEING is experimenting with a small gas turbine with prop that may get a try-out soon on the Boeing L-5 *Scout*, US Army and Air Force liaison plane.

FLIGHT TESTS are being run on the new RB-36 reconnaissance plane, newest version of the long-range Consolidated Vultee B-36. Like the B-36, the RB-36 is equipped with four jet engines in addition to its six piston engines. These jet units, mounted in pods beneath each outer wing panel, provide additional power for take-off, improve rate-of-climb, raise the service ceiling, and increase the plane's speed.

SWEPTBACK WING developments of the Grumman F9F and the McDonnell F2H will be designated F10F and F3H respectively.

LIAISON PLANE designs in the competition the Air Force is conducting for the Army are expected from Aeronca, Boeing, Convair, cessna, Piper, Taylorcraft, Temco, Jamieson, Aerobat, Emigh, Johnson, Aero-Flight.

ROTC STUDENTS from 127 colleges and universities throughout the country will attend summer training sessions at nine USAF bases this year. Numbering 4124, these Air Force Reserve Officer Training Corps students will spend six weeks studying specialized courses.

SEVENTEEN Air Force Fighter Wings and two National Guard Wings will send teams to Las Vegas, Nevada, to compete in the second annual world-wide Air Force Gunnery Meet. Date for the Meet is March 29. Both jets and "conventional" fighter planes will be flown by the best qualified fighter pilots in the USAF and Air National Guard. Three teams will fly F-86's, five teams will fly F-84's, six teams will use F-80's and two teams, F-82's. Only wartime planes entered will be F-47's flown by two teams, and F-51's by one team. The Meet will last seven days.

SAFE FLIGHT indicator developed by Dr. Leonard Greene is now standard equipment on such military aircraft as North American F-86, Chance Vought and McDonnell jets for the Navy, and the Grumman F9F. Boeing's XB-49 jet flying wing bomber has an SFI installed for test purposes.

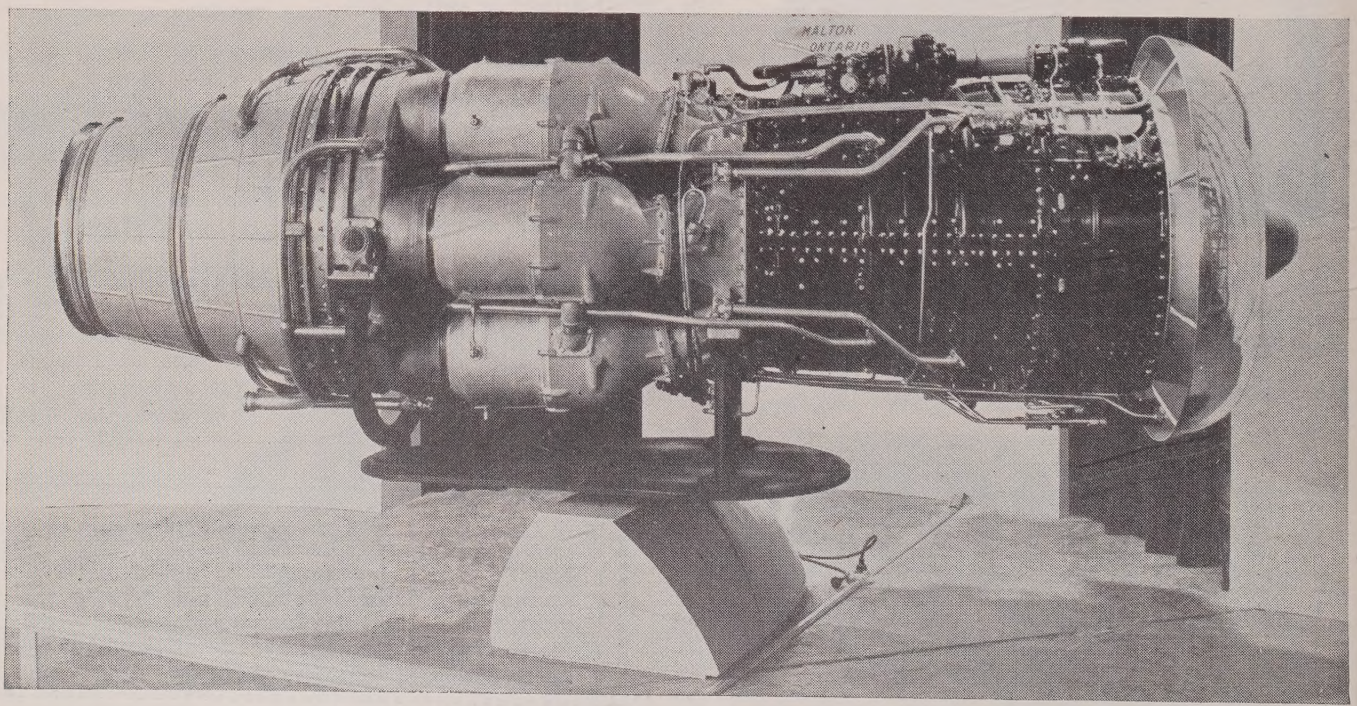
AIR FORCE has accepted a prototype of the Linktronic trainer developed by Link. The first electronic ground trainer for jet planes, it promises to speed up jet pilot training and reduce training costs. In quantity production, the trainer costs between $40,000 and $50,000 each, about 25 per cent of the price of a T-33 jet training plane. Operation costs run $15 per hour, including instructor's pay, maintenance, etc.

ARMED FORCES DAY will be observed throughout the nation on May 20, according to announcement by Dept. of Defense.

NAVY's new "flying laboratory" is a Lockheed *Constellation*, designated PO-1W. Especially modified, this Connie was built to test airborne early-warning radar devices and procedures. This equipment, developed by the Navy's very active Bureau of Aeronautics, provides an important means of defense against enemy bombers and enemy fighter aircraft. It overcomes the basic limitation of shipboard and surface radar which cannot "see" over the optical horizon, and so can be evaded by enemy planes flying at low altitudes and high speeds. The new airborne equipment permits the "sighting" of the enemy so that friendly forces can be notified by radio of the location and movements of the attacker, and intercepter planes sent up to meet the attack. The PO-1W has a range of more than 5,000 miles, and a top speed of over 350 mph.

LATEST information in the "race" for jet unit power is that Allison still holds the edge. Its new J-35-23 is reported to have thrust of 9,200 pounds. GE's J-47 in its advanced version is said to have close to 8,000 pounds thrust. Its predecessor was rated at 5,200 pounds thrust.

AVRO ORENDA is the new jet engine which is to be installed in the Avro CF-100, the Canadian-built twin-jet long-range fighter



PLANE FAX

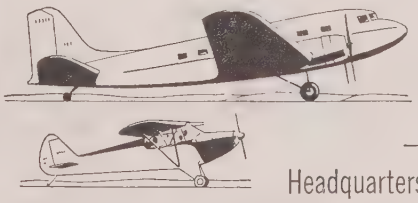
Light aircraft operators reduce overhaul expenses 45%

"We've extended the overhaul period on our privately owned light aircraft from 600 to 1100 hours by using RPM Aviation Oils," write L. E. Kershner and Floyd Murphey of Aircraft Sales Company, Prescott Municipal Airport. "This has cut our overhaul costs about 45%. For planes such as we have operated and are now operating, we are glad to recommend RPM Aviation Oil for more successful operation and less expensive flying hours.

Quick picture of

PRESCOTT AIRPORT Arizona

Key airline base—1 scheduled plus 11 passenger and 2 cargo non-scheduled airlines



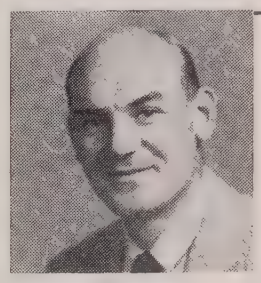
24-hour CAA radio and weather service

Headquarters—Two flying schools

6000-foot and 4400-foot paved runways—full taxi strips

"No other lubricant we've used has kept our engines so clean . . . so free from rust and corrosion. We've had no difficulty whatsoever with crankshafts, cylinder walls or bearings since the day we switched to RPM Aviation Oil."

TIP OF THE MONTH



"Take advantage of local radio and weather facilities—they're free."

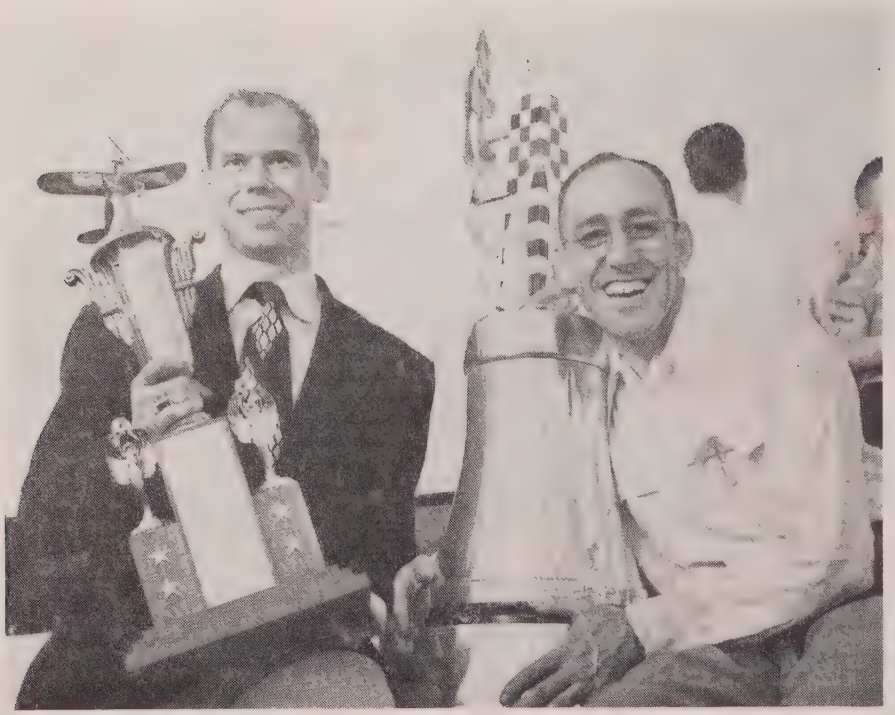
"Pilots could help themselves to safer, more pleasant flying if they'd only be sure to use the radio and weather facilities available at many fields. It's strange—but true—that some plane operators having radio equipment in their own planes pass up these facilities entirely."

L. E. KERSHNER, Mgr.,
Aircraft Sales Company, Inc., Prescott Airport.

Modern, round-the-clock service for all transient aircraft

Prescott Airport's manager, Jack Bucher, explains: "Thanks to the large flow of airline traffic through Prescott Airport, visiting pilots from other fields may enjoy complete guest facilities here. That includes a modern terminal building, cafe, overnight cottages, repair and overhaul services, and all Standard products—powerful new CHEVRON 80/87 Gasoline, RPM Aviation Oils and Greases."

CHEVRON AVIATION GASOLINE
RPM AVIATION OIL
Standard Oil Company of California



AIR MANEUVER winners at Miami air show were Bob Jocelyn *(left)* and Steve Wittman

HANGAR FLYING

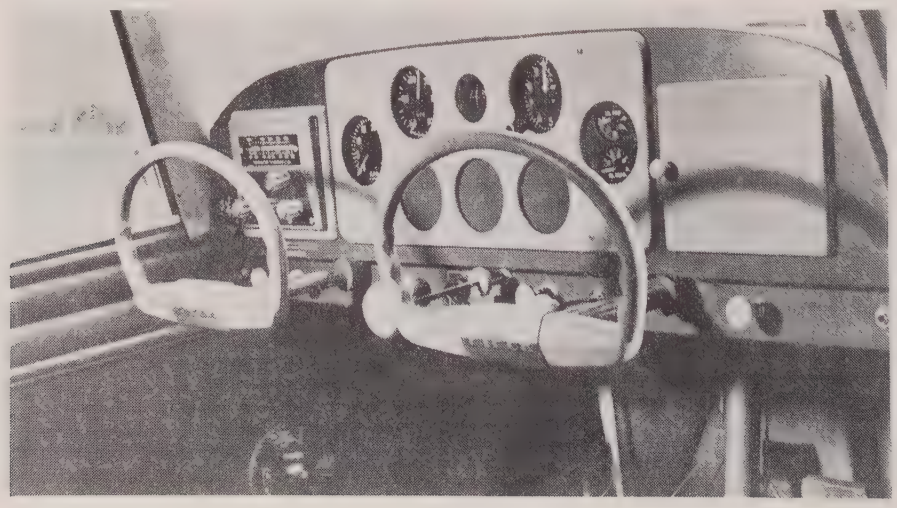
Ercoupe for 1950

The 1950 model of the *Ercoupe* "Club-Air" was recently announced by Sanders Aviation, Inc., world-wide distributors of this well-known spin-proof airplane. New features in the 1950 "Club-Air" include lateral trim control to make "hands-off" cross-country flying easier, re-styled cabin, all-over paint design, and an improved soundproofing. Perhaps of greater pilot interest is the fact that "three-control" system is available as optional equipment for those who do not want the *Ercoupe's* customary "two-control" system. In addition, a conversion kit is available for those who own postwar *Ercoupes* and want to make the change-over to the so-called "three-control" type of operation. Price of the new model had not been established at time of writing.

Better Weather Forecasts

Pilots may look for an improvement in weather forecasts and weather information service as a result of the opening of a new 10,000-mile "express service" communications circuit by CAA. The new circuit will link about 40 of the largest cities in the U.S. in a coast-to-coast and border-to-border network. It will also reduce congestion on the already overburdened regional circuits, resulting in better service to pilots and others interested in weather reports of adjoining rather than distant areas. As the Weather Bureau points out, it will now be able to follow significant fronts, blizzards, heavy rainstorms, etc., with hourly rather than three- and six-hourly reports. This is bound to make X-C flight planning easier and will improve reliability of weather information.

PIPER PACER panel includes two-way GE radio, plus space for extra flight instruments



Flight Plans

Aero Notes, published monthly by the Indiana Aeronautics Commission, reminds us of the CAB's warning that beginning a cross-country flight without filing a flight plan is asking for trouble. As the CAB put it, "Records of the Accident Analysis Division of the Bureau of Safety Investigation show a surprising number of cases of pilots who failed to file flight plans. They took off on flights of various lengths to various places without leaving a single word behind with anyone as to where they were going. And they never got there! Search for them was held up because obviously it could not be started until they were known to be missing, and then no one knew where to look for them."

Soooo, pilots . . . . file those flight plans without fail on your cross-countries!!!!

New Skytour Resorts

Skytours, Inc. announces three new Air Resorts to add to its list of 35 hotels and lodges that cater to the flying crowd. These inns and lodges offer members of Skytours, Inc. a 10 per cent discount and free ground transportation to and from the airport. The three new Skytours Air Resorts are Mount Plymouth Hotel and Golf Club at Sorrento, Florida; Hoberg's Desert Resort, Borrego Springs in San Diego County, California; and The Wigwam Hotel at Litchfield Park, Arizona.

Jet Engine for Commercial Use

The CAA has announced that the General Electric J-47 jet engine has been certificated for commercial jet transportation use. Considered the most powerful aircraft turbojet in production in this country, the J-47 has logged several thousand hours of flight test time.

All American Air Maneuver Winners

Steve Wittman of Oshkosh, Wisconsin, continues to lead the field of air race winners. Latest win for Wittman, a school teacher when he isn't rounding the pylons, was at Miami's All-American Air Maneuvers. Steve was winner of the 1950 $10,000 Continental Trophy. He won it last year, too. In the aerobatic competition, winner was Rodney Jocelyn of Langhorne, Pennsylvania, a relative newcomer to aerobatic flying. Jocelyn walked off with first prize in the Gulf Oil National Aerobatic Contest. In addition to the first place trophy, he took $1,750 in prize money. In this competition, Bevo Howard took second place, and Betty Skelton copped third-place honors. This was the first time Miss Skelton had competed with men in the aerobatic field.

New Pipers

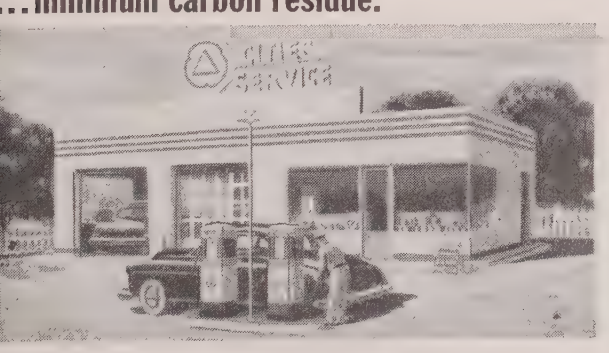
The Miami All-American Air Maneuvers was the time and the place for the announcement of Piper's five new 1950 airplanes. Two of the new models displayed at Miami were versions of the well-known trainer and general utility airplane, while the remaining three 1950 models were improved versions of the 1949 *Clipper*, now designated as the Piper *Pacer* (reason for name change was Pan American Airways' objection to the name *Clipper*. Pan Am's Boeing flying boats were named *Clipper*, thus Pan Am claimed "prior usage".) Carrying the *Cub* name are the *Super Cub* 95 and the *Super Cub* 105. Powerplants are Continental 90 (*Super Cub* 95) and Lycoming 108 (*Super Cub* 105).

It's the Best Motor Oil known to Science

(Partial view of the enormous new lubricating oil plant at Lake Charles, La., where this great new oil is processed.

"ANTI-FOULING" OIL made by the Remarkable new "HEART-CUT" PROCESS

This new oil—the best known to science... gives you a cleaner engine...more economy ...minimum carbon residue.



It's here now! The remarkable motor oil from the giant new $42,000,000 lubricating oil plant at Lake Charles, La. The plant that's been the big talk of the oil industry for months.

New Premium Koolmotor is made by the unique "Heart-Cut" Process which retains only the choicest part of the finest crudes. *It's so superior that in recent engine tests it outscored nine other major premium motor oils.* No wonder Premium Koolmotor is better in every way! Cleans better, seals better, cools better and fights acid, sludge and corrosion far more effectively. Switch to this remarkable new oil today.

start saving Dollars today...stop at

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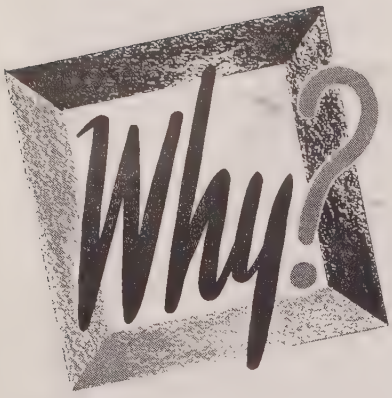
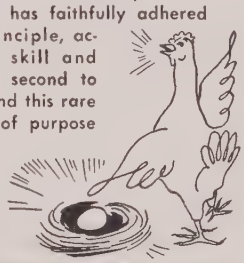


QUESTION:

Why is the SAC aircraft shop the all-time favorite of executive aircraft pilots throughout the Western Hemisphere?

ANSWER:

Eighteen years ago this shop was established to provide "airline maintenance for the private owner" It has faithfully adhered to this principle, accumulating skill and experience second to none. Behind this rare singleness of purpose are . . .



INDIVIDUAL KNOW-HOW

To work in the SAC aircraft shop is a badge of distinction among mechanics . . . Only the best are hired . . . Respected old timers are in command . . . Factory techniques and factory training go into every job.

SPECIALIZATION

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One Hundred Hour Inspections

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NAVION	$ 70
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And scores of others!

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PROP WASH

Aero Oddities

Follow Me. During the war many student pilots flying in formation on night flights had trouble following the pin point lights of the ship ahead. One student in Texas tried to join up with the red wing-light of another ship . . . discovered too late that light was the tail light of an oil truck. *(T. Kay, San Francisco, California)*

Wing Low. An Air Force pilot on a cross-country flew all the gas out of his right-wing tank, landed at an air base with 60 gallons left in his left-wing tank, noted on "squawk sheet," that plane was left-wing heavy! *(K. H. Kapner, Englewood, N. J.)*

Today's Ways. Farm hand was offered job on farm in another state. He rented lightplane, flew it over prospective employer's farm, didn't like the appearance of buildings or fields, refused the job. *(A. Miller, Bowman, N. Dakota)*

Free Advertising. Group of Navy cadets on training mission were given the word on their formation flying by rugged, rough instructor speaking to them over radio. After last cadet took his brow-beating, he was asked by irate instructor how he thought he could get back to the field, knowing so little about flying. Before cadet could reply, another cadet in another practice area called in on same frequency, "Why not 'snap back with Stanback'?" *(J. W. Glover, Carlsbad, New Mexico)*

Invention's Mother. A plane-owning resident canvassed his neighborhood, borrowed bathroom scales from three of his neighbors. He took the scales to the airport, placed a scale under each wheel, then proudly informed interested onlookers that his lightplane weighed only little more than 500 pounds! *(E. E. Gentry, Marthaville, Louisiana)*

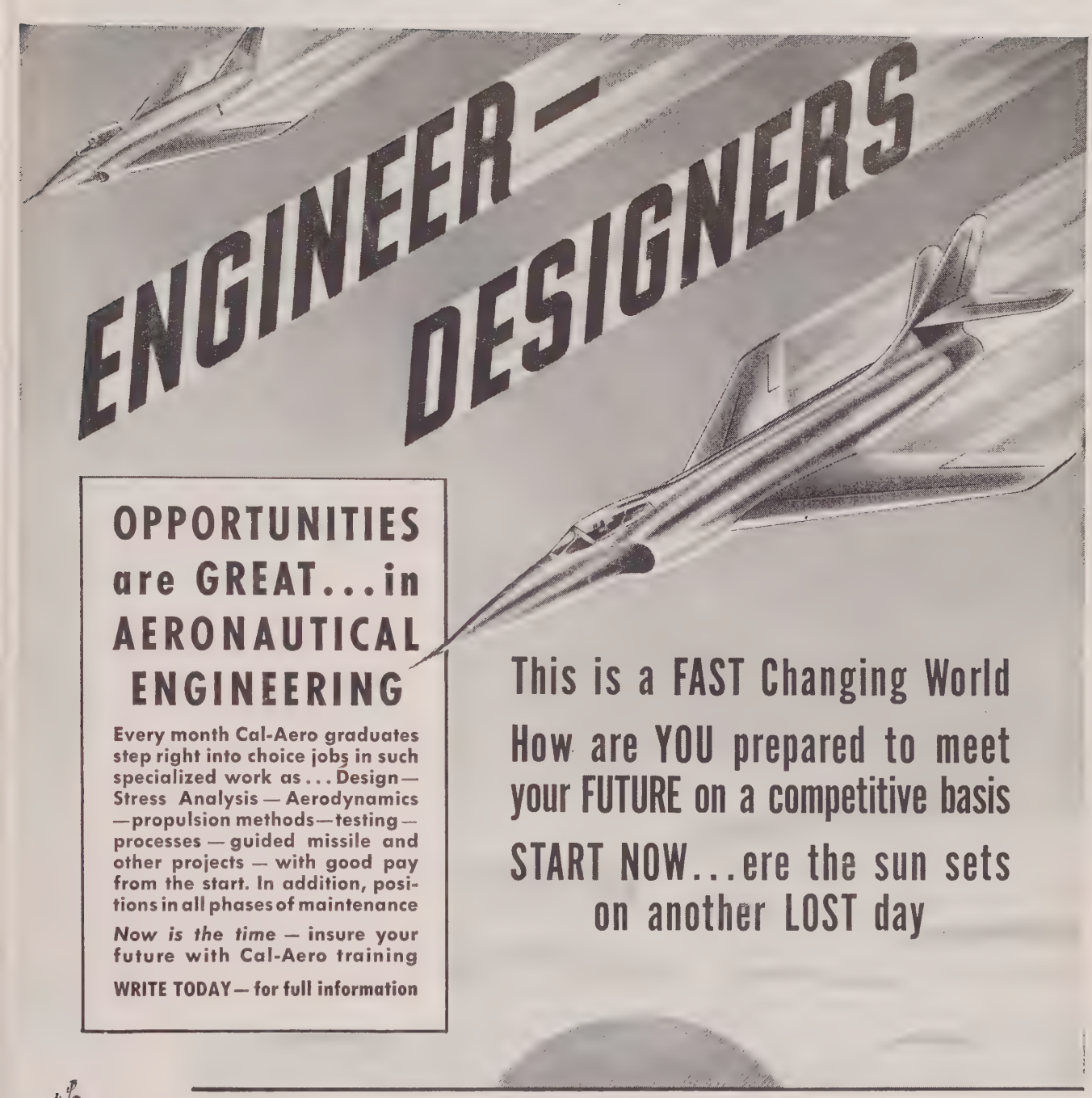
Out and Down. Returning from mission in badly shot-up B-17, pilot commanded crew to toss everything they could out of ship to lighten it. Crew complied by getting rid of everything including the guns. On return to base, pilot filled out form to report loss. As to *where* guns were, pilot wrote, "Gone with the wind." For why, he wrote, "Our eight ball was rolling." *(Pvt. K. Smith, San Francisco, Calif.)*

New Angle. The Air Force press section is still chuckling over a young female reporter's efforts to digest the meaning of "angle of attack." Described to her, she pondered it for a second or two, then exclaimed: "Oh, I understand! It's the angle at which a plane attacks the enemy." *(Reprinted from Fairchild Corp.* "Pegasus")

Fool's Luck. Student took old biplane up for practice spins. After first successful spin, student climbed back up for another. This time he could not bring ship out. Hundred feet from ground student finally climbed out on biplane's wing, was there when ship hit marsh land at edge of airport. Plane was demolished but student suffered nothing more than sprained shoulder. When asked why he hadn't bailed out, student replied forces of gravity had held him in until almost last second. Investigation proved he had forgotten to unfasten seat belt, finally had broken it in time to climb out. *(R. B. Lemieux, Big Rapids, Mich.)*

Att'n Readers:

If you have any news note oddities pertaining to aviation, send them to SKYWAYS, Box 17, 444 Madison Avenue, New York 22, N. Y. Five dollars will be paid the sender of each "oddity" printed. Contributions cannot be returned unless accompanied by stamped addressed envelope. The decision of the editors is final.



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Check one. ☐ Veteran ☐ Non-Veteran

S-4

Sky-High Sabre Dance

NORTH AMERICAN SABRE is said to be "fastest fighter the Air Force has." On hop from Dayton, Ohio to Washington, D.C., the F-86 made trip in 33 minutes, 3 seconds . . . or at speed of 710 mph. Test Pilot is George Welch *(left)*

By GEORGE WELCH

(Project Pilot on North American's F-86* Sabre*)

as told to Don Downie

You'd be surprised how easy it is to fly the F-86 It's a wonderful airplane, this F-86 *Sabre*, and it flies just like a big *Cub*.

Come along on a test hop and see if you don't think that almost any pilot could handle this Air Force speedster.

Before you go out on the flight line, you check the weather and have a talk with the engineering crew to see just what they want done.

Then you walk around the airplane, just like you would with a *Cub*, to make sure that the fuel caps

are all on. On the *Sabre* you have to check to be sure the safety pin is out of the nose wheel. If it isn't, the nose wheel won't steer.

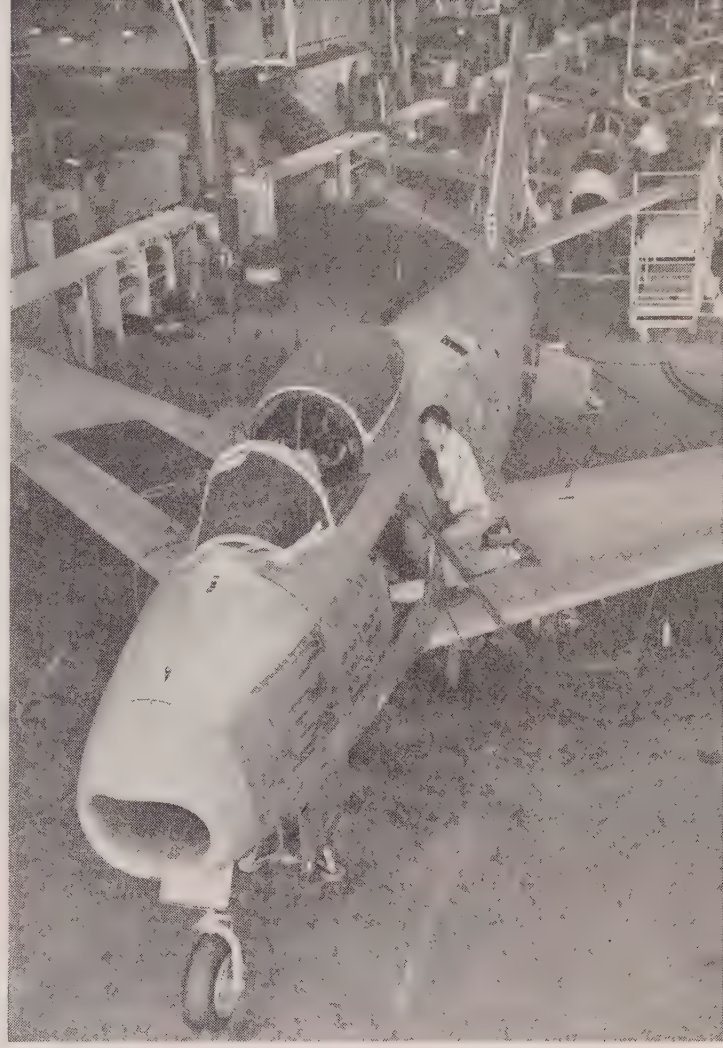
As you climb into the cockpit, you pull the pins out of the ejector seat. If you forget that, you don't get out of the airplane in a bail-out. This seat will throw a pilot 46 feet into the air when you pull the escape handle beside the seat. It's a gunpowder proposition that blows off the canopy and fires the seat a tenth of a second later. Then you leisurely unhook the seat and open your 'chute—so they tell me. I've never had to use it.

Naturally, we use a "G" suit, a Lombard crash helmet and a standard demand-type oxygen mask. Other equipment includes an oxygen bail-out bottle, gloves and sun glasses. Most of our records are made with camera recorders, but I usually carry a clip-board on a knee-pad for taking notes.

After you're all strapped in, the ground crew plugs in the electric starting unit and you test the dozen warning lights on the instrument panel.

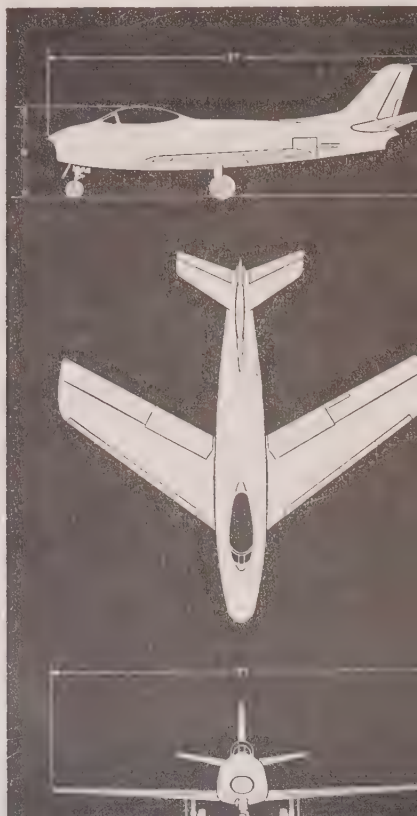
I use the same procedure on the F-86 that almost all test pilots use for any airplane. Begin your checking in one corner of the cockpit and go all the way around the pit. In that way you don't forget anything. In these faster ships, it can be most embarrassing if you skip any of the many adjustments.

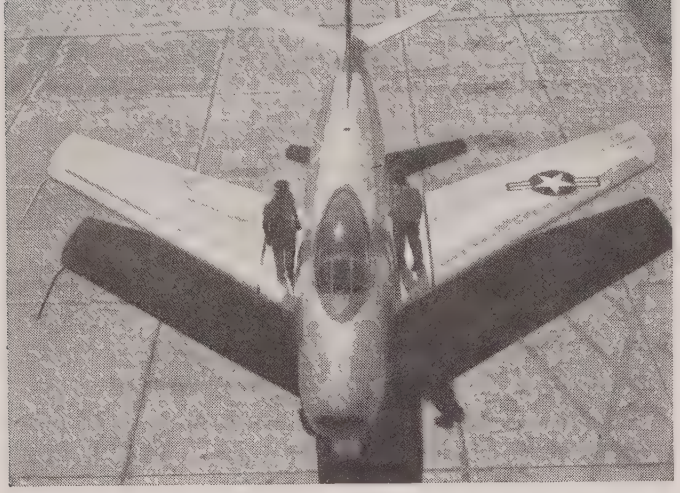
After a not-so-quick once-over in the cockpit, I usually check the rudder pedals for correct length, adjust the stablilizer and aileron tabs and then visually test the cabin pressurization and cooling rheostats. (*Continued on next page*)



SABRES are now coming off North American's production line at "satisfactory rate." AF has or will have 554

SPEED potential of F-86 is due to many factors, one of which is its 35° wing sweepback. Engineers claim ship's sweptback wing and tail, clearly seen in profile drawing, *(below right)*, more or less fit into the shock wave pattern





JET ENGINE that powers the fast F-86 is GE J-47A rated at 5200 pounds thrust. Ship's gross weight is 13,715 pounds

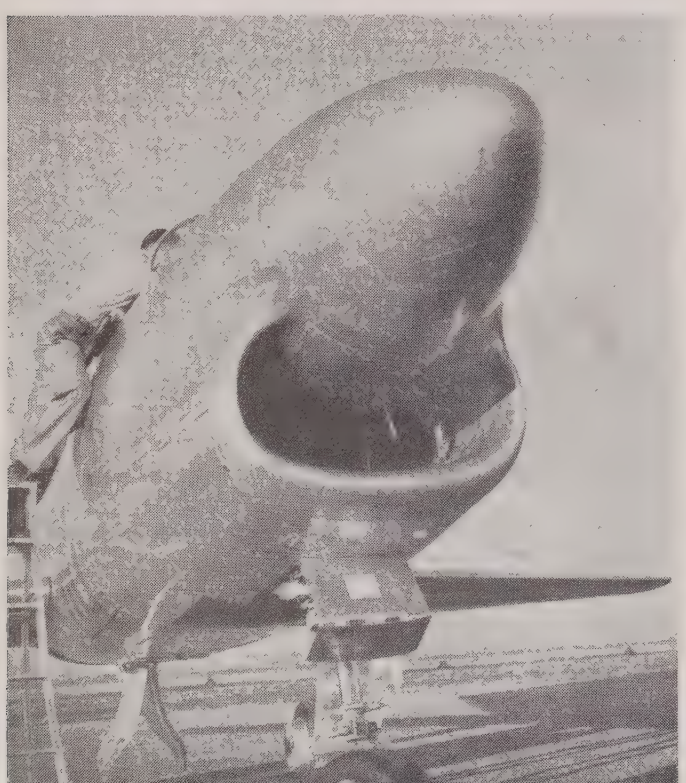
In these high-flying ships, a careful check of oxygen supply and flow is a must.

The F-86 has a console panel with gear and flap indicator lights and fuel selector valves behind the stick between the pilot's legs. In all, there are over a dozen indicator lights when you include two fire-warning lights, four landing gear lights, two generators, a converter and trim-tab indicators.

Then you're ready to fire-up the airplane. Turn on the engine master switch and engage the starter. When the 5200-pound thrust General Electric J-47A is turning over about 5 per cent rpm, you can open the throttle part way and the engine will pick up to 20 percent power of its own accord. Then you have the ground crew disconnect the external power source.

This starter unit that we use on the F-86 has a break-away socket, just in case someone gets in a hurry and taxies out with the unit still connected.

NEWEST VERSION of the *Sabre* is the YF-86D, said to be faster, more powerful model. Note new location of intake



With 20 per cent of total rpm's, the hydraulic system will operate and you can close the dive brakes along the sides of the fuselage and drop flaps to the take-off setting.

Then you're ready to pull the chocks and taxi out for take-off. It's not at all like the F-51's that I first tested here at North American. There is no long, careful warm-up with a jet. You have neither mags to check nor propeller settings to adjust. About all you do check is the indicator on the oil pressure gage because the engine won't run very long without lubrication. This ship can be ready to fly within one minute after the energizer is disconnected.

Actually, the faster you can fire-up and get into the air, the better off you are. When that engine is turing over at anything below 10,000 feet, your fuel consumption is very high.

Taxiing takes about 25 per cent power and the ship steers just like a car. The nose wheel swings out with the slightest pressure on toe brakes. Visibility is perfect and radio procedure is completely conventional.

Just before take-off, I always run up to 100 per cent power and check the auxiliary fuel pump. Then there's that last-minute check of complete control freedom that every pilot should make in any airplane just as he taxies into take-off position.

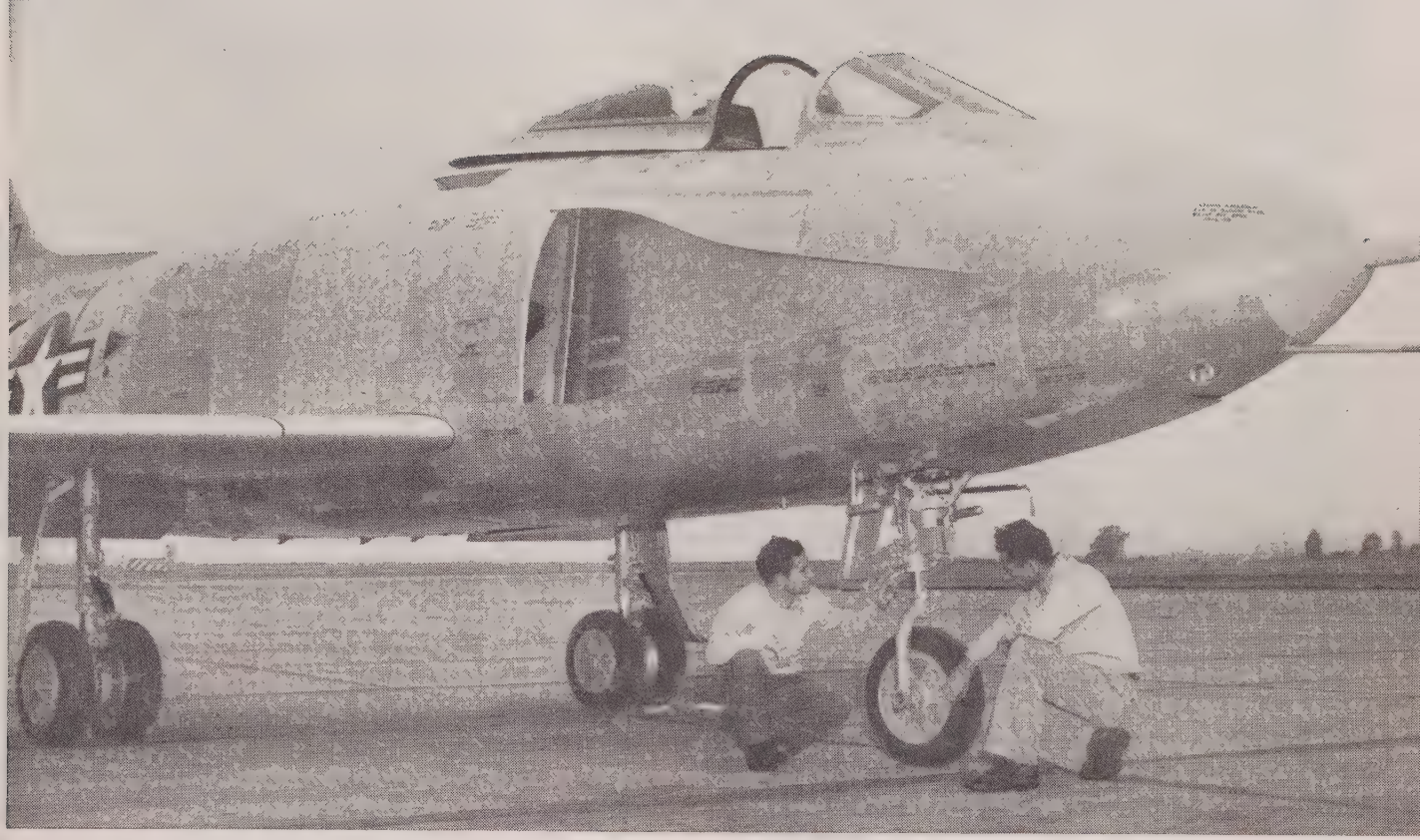
The actual take-off is a cinch. There's no propeller torque to fight and you just point the ship down the runway. At about 50 mph, you can bring your toes down off the brakes and begin to steer the ship with the rudders. The actual take-off speed is slightly higher than the F-51.

I leave the nose wheel on the ground until I'm going fast enough to take-off and then haul back on the stick. With its extreme 35° sweepback in the wings, the *Sabre's* nose on take-off comes up a lot higher than a conventional aircraft. It makes the ship a bit blind straight-ahead during the actual take-off, but no one in a fighter ever looks ahead at that time anyhow. I look out the left corner of the windshield. Actually, visibility on take-off is about the same as an F-51 but it's a lot better in the F-86 once you're in the air.

As soon as you break ground, you get the gear up. When all the indicator lights go out, the gear is up and locked.

You're accelerating so rapidly by this time that you can hit the flap lever and spill your added lift. This airplane picks up speed faster than anything I've ever been in, and I've flown just about every fighter that has been built in the past 20 years.

On test flights, I normally go up to 40,000 feet. That's where you get the best speed and lowest fuel consumption. How fast does it climb? Well, that's a good question—but the (*Continued on page 47*)



AIR FORCE'S NEW JET, the YF-93A, is heavier than most fighters and requires the use of dual-wheel landing gear

NEW JET FIGHTER FOR AF

THERE'S a new high-speed jet penetration fighter in the Air Force hangar. Developed by North American Aviation, the new fighter is designated YF-93A. It just recently made its first flight at Edwards AFB, Muroc Dry Lake.

Powered by the new Pratt and Whitney J-48 turbojet engine with 6,250 pounds static thrust, the YF-93A is designed to fly operationally at a speed close to the speed of sound. An afterburner affords extra bursts of speed. Installation of the J-48 unit marks Pratt and Whitney's entry into the field of jets for the Air Force as well as the Navy. Featuring sweptback wings, the YF-93A further increases the advantages of this configuration with a streamlined contour or "coke bottle" fuselage.

The new '93A is also heavier than most current fighters, and it requires a dual-wheel landing gear. Other features include automatic slats and slotted-type wing flaps which add maneuverability. The fighter has a wing span of 39 feet, is 44 feet long and 16 feet high.

TURBOJET engine with afterburner that powers YF-93A is a Pratt and Whitney J-48. Note plane's sweptback tail

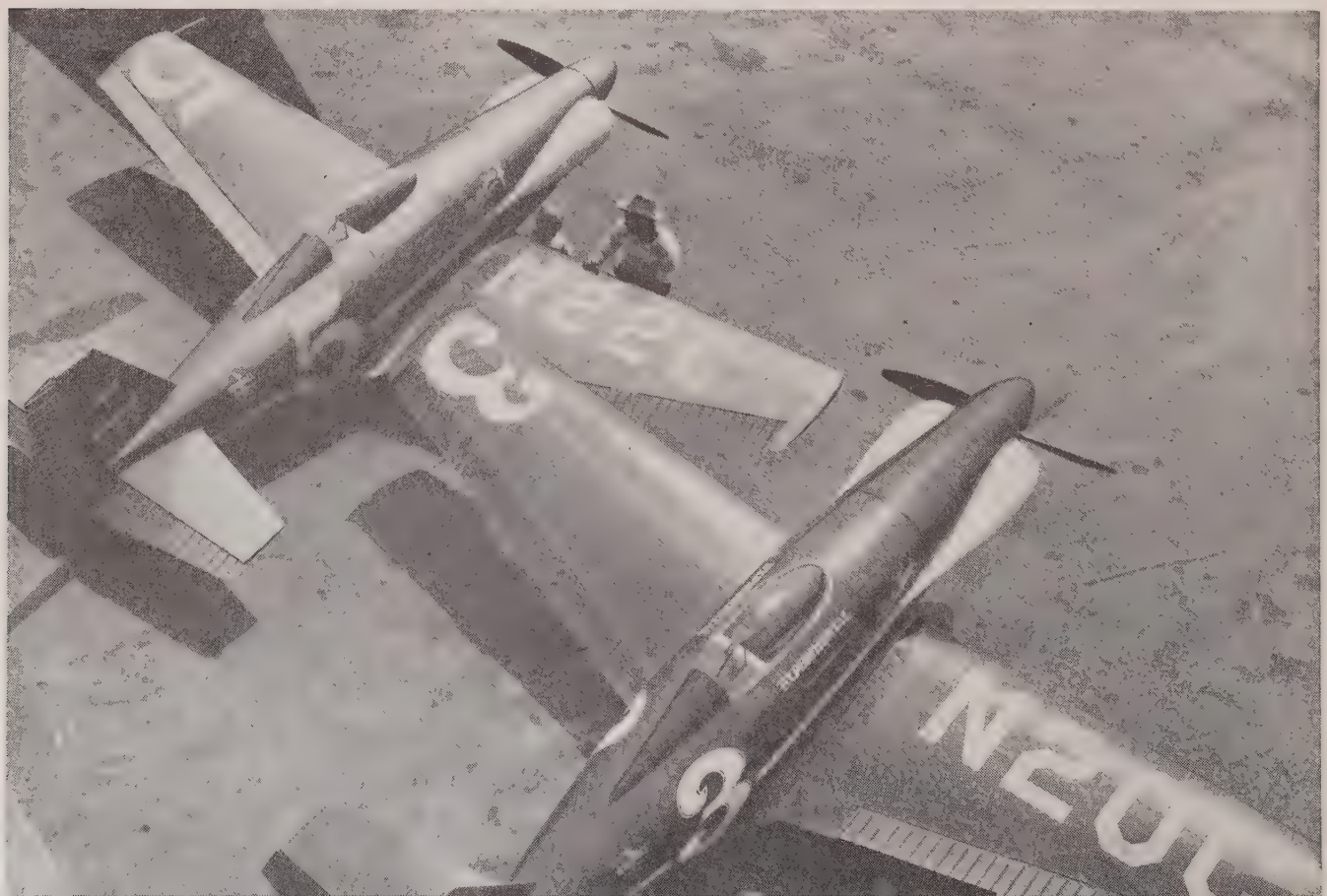
PILOT-AUTHOR SALMON tows *Cosmic Wind* into the hangar by its tailskid. The little racer weighs just 565 pounds

COCKPIT of the *Cosmic Wind* is a tight squeeze for Fish, nevertheless all 5 feet 10½ inches of him fits in well

Pilot's Report...

Cosmic Wind

COSMIC WINDS seen at most races are Fulkerson's "Ballerina" (#5), LeVier's "Little Toni," Salmon's "Minnow" *(not shown)*



If you've ever thought of flying a midget racer, try one on for size

By HERMAN "FISH" SALMON

Engineering Test Pilot, Lockheed Aircraft

IF IT was any smaller, you could wear it! The wing span is 16 feet. It weighs 565 pounds, has a one-inch rubber pad for a seat and swings a prop that is five feet from tip to tip.

That's the *Cosmic Wind*—one of the Goodyear-class racing midgets that competes each year at the Cleveland Air Races and elsewhere.

There are three of these *Cosmic Winds*. All came off the same assembly line in garages around Los Angeles, California, when Tony LeVier, Glenn Fulkerson and I teamed up with 30 other Lockheed members to build a good midget racer. Since they were completed, these three little airplanes have won $21,000 in races at Cleveland and Miami. Our cost for the three ships was $45,000, so you can see there isn't much profit in that—yet.

These *Cosmic Winds* fly just like a little F-80. There's nothing in the commercial list of airplanes that is as snappy on the controls and has as rapid maneuverability as these. (*Continued on page 53*)

PANEL in LeVier's racer has few instruments not "stock" for racing, *i.e.* cylinder head temp and selector switch

MIDGET RACERS lined up at Cleveland last year included two *Cosmic Winds:* "Ballerina" #5, (right), and "Little Toni"

Hell-Bent for Rescue

SURVIVORS of the B-29 ditched in the Atlantic 400 miles off Bermuda owe their rescue to Flight "D," Kindley AFB

By TERRY KAY

THE laconic words of the plane commander sent a chill through the ship. Men shivered imperceptibly, yet beads of sweat showed on their faces as they jettisoned everything movable.

"Prepare to ditch!"

The B-29 was lost . . . radio was out . . . navigation impossible . . . and the overcast above matched the dirty grey of the angry Atlantic below. Only minutes of fuel remained.

Lt. Col. John Grable brought the big ship down low over the white caps. Closer . . . closer . . . closer to the turbulent sea, its waves looming higher the

MINUTES after being alerted, Flight "D's" SB-17 with its rescue boat attached to the belly of fuselage was up and away, hell-bent for rescue of the crew of the lost Air Force B-29. Sixty hours later the survivors were spotted

nearer they got to the maelstrom of motion below. The ship leveled off, then . . . impact! Metal screamed and wrenched as it slammed against the might of the ocean.

It seemed like legs in all directions as the airmen scrambled out of the ship into the cold water. The hapless '29's tail broke off. In less than a minute, the hulking ship turned her nose beneath the swells and disappeared into the angry depths of the sea.

Crewmen swam and paddled their way to the wave-tossed life rafts that had automatically popped from atop the plane's fuselage. Two men didn't make it. They sank below the surface with the ship they'd nursed for hours on a mission that would never know completion.

Huddling nine men to each raft, the 18 survivors mixed epithets with prayerful thanks, then peered hopefully into the murky overcast, ears straining for a sound of a rescue plane.

One solid fact meant life to them. Before the radio had gone out . . . before they'd ditched the ship, the radio operator has contacted Kindley Field, Bermuda, and Flight "D" of the First Rescue Squadron, USAF. Now they waited, unaware they were almost 400 miles from Bermuda, the closest land.

Night came on. A raft capsized in the heavy swells. Luckily everyone got back aboard. Cramped, soaked, miserable, 18 airmen waited . . . waited . . .

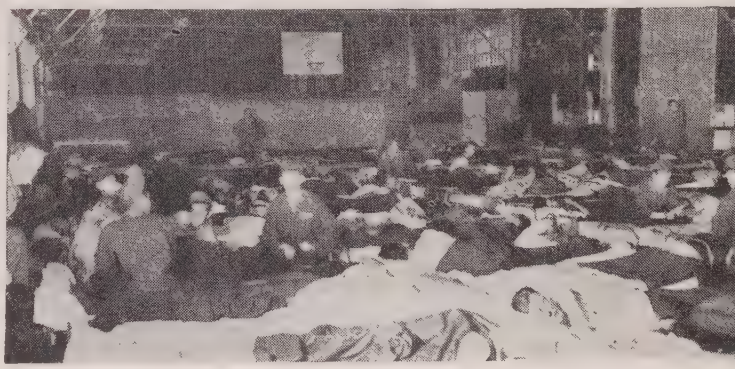
At Kindley Field's Rescue Control Center, men of Flight "D" First Rescue Squadron (formerly Sixth Rescue Squadron), hurriedly amassed all the information for a full-scale search. They checked off position of last contact with the distressed B-29, its point of departure, time, speed and weather.

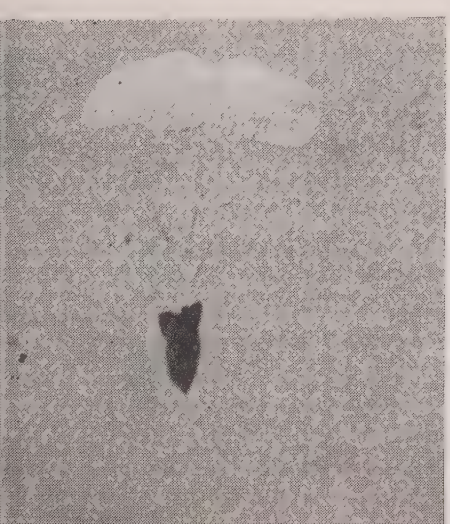
Even before the B-29 was ditched, one of Flight "D's" two SB-17's was hell-bent out to try and intercept the lost ship.

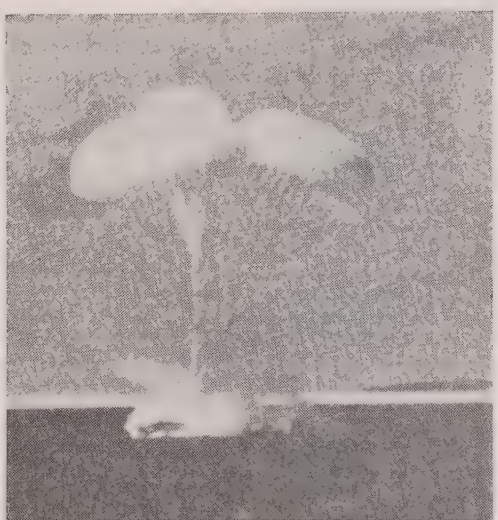
Fifteen minutes after being alerted, the Flight's other SB-17 "Dumbo" was airborne, roaring seaward to offer its (*Continued on page 56*)

FLIGHT "D's" commanding officer is Capt. George Welch *(center)*, shown here with other officers of Rescue units

RESCUE CREW that made boat drop to survivors is shown here after nationwide radio interview *(above)*. Rescue crews came in from all parts to join in search. Over 1,000 extra crewmen were billeted in Base gym *(below)*







RESCUE BOAT is photographed *(below)* in practice drop from SB-17. Note boat's angle just prior to hitting water.

On impact, the 'chutes collapse. "Rescued" airmen climb into the 48-foot boat, then retrieve the three 'chutes

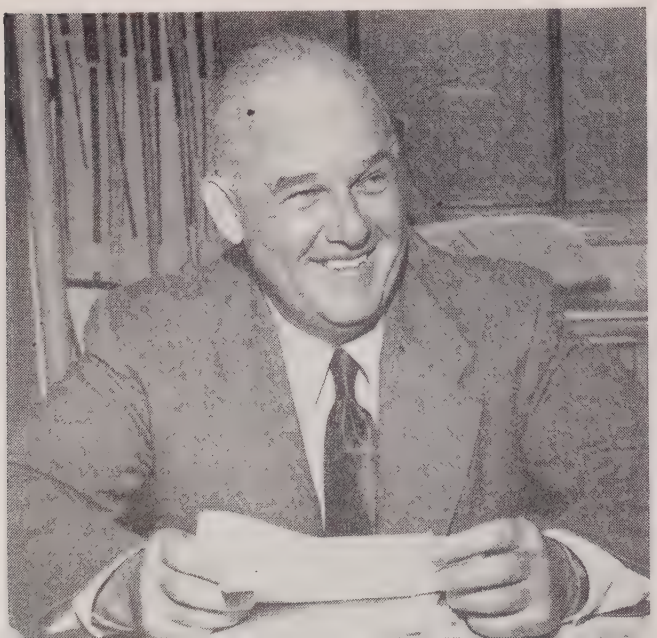
So You Want to Break a Record!

By Capt. NORMAN MARSH, USMCR

Creator of the King Features Syndicate adventure strip "Danny Hale," and a pilot of thirty years' standing

RECORD-BREAKER—potential, that is—was Marine Reserve Capt. Norman Marsh. The flight? Los Angeles to N. Y.

LIGHTPLANE used for the cross-country record-breaking attempt was Marsh's heavily laden Aeronca *Sedan (above)*



CREATOR of comic strip "Danny Hale," Capt. Marsh *(below)* is more or less accustomed to flights of fancy and fun

IT WAS around the middle of this summer that I found myself surrounded by an idea which I suppose comes at least once in every lifetime to flyers who live on one coast of the United States or the other. I was going to take off from Los Angeles Municipal Airport and break the coast-to-coast non-stop record for lightplanes.

It is the easiest thing in the world for anyone to get an idea about making such a flight and about the hardest thing in the world to carry it out, if you will permit some basic first-term philosophy. To break that down: I guess if I had known then what I found out in the weeks immediately preceding my first try at the flight, I would have said "Aw, Nuts" and gone back to flying up to San Francisco for weekends for amusement.

ultimately to $350. That did not include the cost of the one sandwich, the soup in the thermos and the benzedrine pills on which I dined across country.

I finally evolved the financial and time problems and turned to fuel. This I had originally dismissed as an ordinary problem, but suddenly I discovered that it required *Engineering*—handmade, gilt-edged, platinum-plated hose lines, fuel pumps, handmade special fuselage gas tanks, etc. Hell, I could rig all that myself with a pair of pliers and a short turn of baling wire. Hah! Like 'ell I could!! Anyway, finally all this was done. Then came the additional instruments necessary. Those were installed. Then the question of the right prop—that was guessed at—and guessed right! (*Continued on page 48*)

LOS ANGELES Marine Reserves shared Marsh's enthusiasm for the trip, were at the field to help him get away

MARINES bade Capt. Marsh godspeed in his attempt to establish a new lightplane transcontinental non-stop record

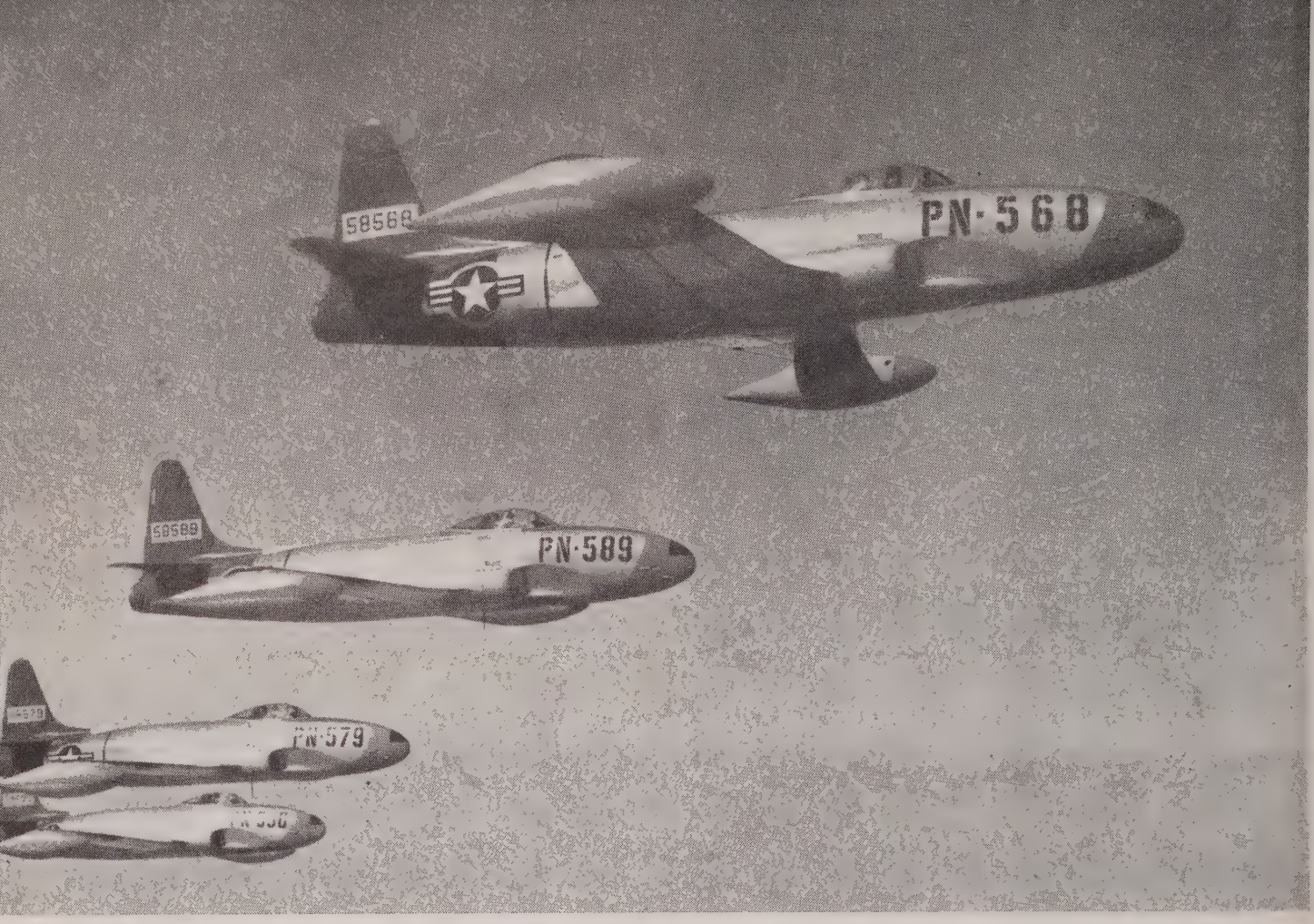
AERONCA SEDAN was so loaded there was barely enough room for the husky cartoonist-pilot faced with hours of sitting

Instead, I said happily, "I will climb into my Aeronca *Sedan*, fill the tanks with gasoline, contact the control tower to check me off and then worry only about New York checking me in."

Hah!

The first thing I found out, for example, was that the National Aeronautic Association must time all official record tries. If I was going to shave the mark (30 hours, 37 minutes) to 23 hours with the greatest of ease, it must be done with the NAA's sanction and that of the Federation Aeronautique Internationale.

Then I learned I had to pay $25 for a permit fee and $50 to timers at each end of the flight. I had to rent a barograph for another 20 bucks, and there were assorted, similar rentals that brought the tariff



ALASKA Fighter Wing flies day and night in all kinds of weather to prove no limitations in jet operations

JETS on the GAGES

Jet pilots claim edge in battle with conventional heavy bombers

By BOB ARENTZ

HIGH-SPEED instrument-flight research by the cocky and aggressive F-80 jockeys of the 57th Fighter Wing in Alaska has forced revision of the jet fighter's operational limitations. While the B-36's immunity from attack remains a moot question, partly dependent on the fighter's instrument-flight problems, these Alaskan front-line weather researches are beginning to show conclusive proof in the fighter pilot's favor. The 57th is the only Tactical Fighter Group permanently assigned to the Alaskan Theater and will be first up to bat in a polar shooting match with Russian heavies. They show no indication of worry about the outcome.

Heavily manned by battle proven veterans, the 64th, 65th and 66th Squadrons are flying day and night in all weather under the Group command of Colonel B. T. Kliene. The Wing, comprising four groups, is based at Elmendorf AFB near Anchorage under the leadership of Brigadier General Donard R. Hutchinson. It is difficult to render full credit insofar as their operations are mostly of a classified nature, but a few significant conclusions won't be giving any secrets away.

Most of these wise, tough young lads flew escorts for heavy bombers and some of them were in the *Spitfire* and *Hurricanes* that stopped the Nazis cold in World War II. They have seen fantastic reports before on 'flying forts' and it can't be said that they are much impressed.

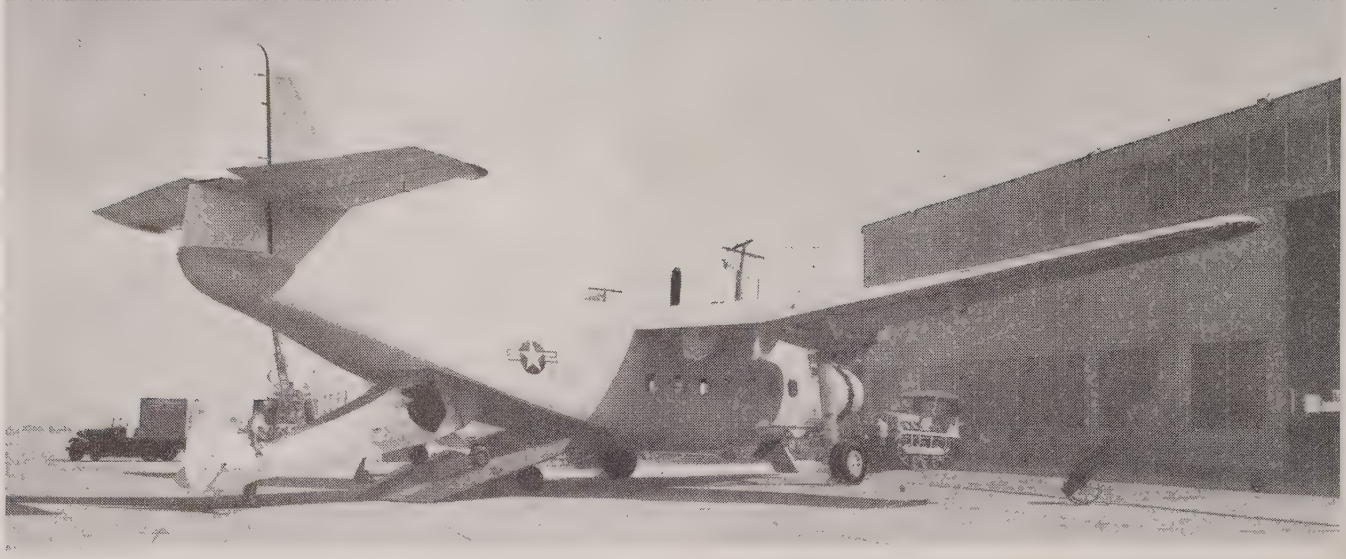
Strategic, long-ranged bombing is a topic with which they have no quarrel. But when you say that fighters can't touch the behemoths at night on instruments, they just act bored. These boys don't know the meaning of the word "can't," especially when it comes to knocking out aerial dreadnaughts of the '36 type.

Properly armed, the jet fighter's problem is two fold: range and instru- (*Continued on page* 54)

CREW CHIEF H. S. Lagg *(above)* of the 66th Squadron adjusts Lt. Harrison's flight gear before the F-80's take off

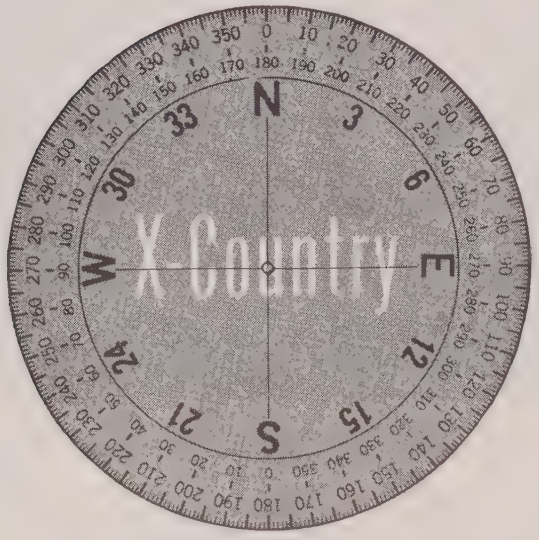
PILOTS of 66th Fighter Squadron check map prior to take-off on night mission *(above)*. Men are Capt. E. Faison, Lt. R. Ramos, Capt. H. Bailey, Lt. R. Luedeka, Lt. E. Manning. The same group *(below)* studies winter flying equipment

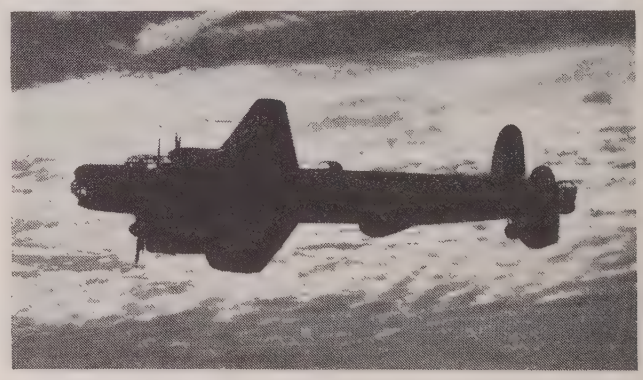
SNOW, WIND and cold are order of the day and night in Squadron's test of jet operations in Alaskan Theater



WORKHORSE of the Air Force is the tri-engined Northrop C-125 *Raider*. Designed to operate from improvised airstrips, the C-125 will replace gliders as airborne assault transports and rescue aircraft. The *Raider* is powered by three Wright engines rated at 1200-hp each. With a gross weight of 35,000 pounds, the *Raider* will cruise at 201 mph; its stalling speed, full load and flaps, is 69 mph.

FLIGHT PHOTO *(below)* provides a perfect silhouette of an Avro *Lincoln* heavy bomber used by the RAF at its Empire Test Pilots' School. The streamlined bulge beneath the fuselage and aft of the trailing edge of the wing is the housing for the ship's radar scanner. Outlined atop the fuselage aft of the wing is its upper gun turret. The Avro *Lincoln* is one of Royal Air Force's standard bombers.





PIPER SUPER CUB 95 is the 1950 version of popular *Cub* trainer. Powered by 90-hp Continental, the ship cruises at 95 mph and has a useful load of 710 pounds, a service ceiling of 13,500 feet. Another version, called the *Super Cub 105*, is powered by 108-hp Lycoming and cruises at 105 mph, has a service ceiling of 15,750 feet.

SHOOTING STARS a'plenty are shown here lined up at Furstenfeldbruck Air Base in Germany. These Lockheed F-80's, with pilots in the cockpits and their crewmen on the wings, were lined up like this at a recent inspection of the sleek-nosed jet ships of the Air Force operating in Germany. Note the dog, squadron's mascot, sitting at crewman's feet on front F-80's left wing.

GRUMMAN F8F (*right*) was flown to All American Air Maneuvers at Miami by Grumman test pilot Roger W. Kahn. This is a standard Navy *Bearcat,* except that it is licensed as experimental for its possible use by Grumman as a ship for testing certain equipment that might conceivably go on other military aircraft built by Grumman. The F8F is powered by 2500-hp Pratt and Whitney.

CLIPPED WING PIPER P-2 is an aerobatic airplane flown by National Air Shows at various air meets in the U.S. The Piper is powered by 85-hp Continental fuel injection engine; it climbs at 1600 fpm, and has 125-mph top speed. It has a wing span of 25 feet. Two ships in flight are Stearman aerobatic planes performing smoke aerobatics. These are also clipped wing ships.

FOUGA CYCLONE, shown here in flight, represents the first in what is expected to be a series of jet-powered lightplanes

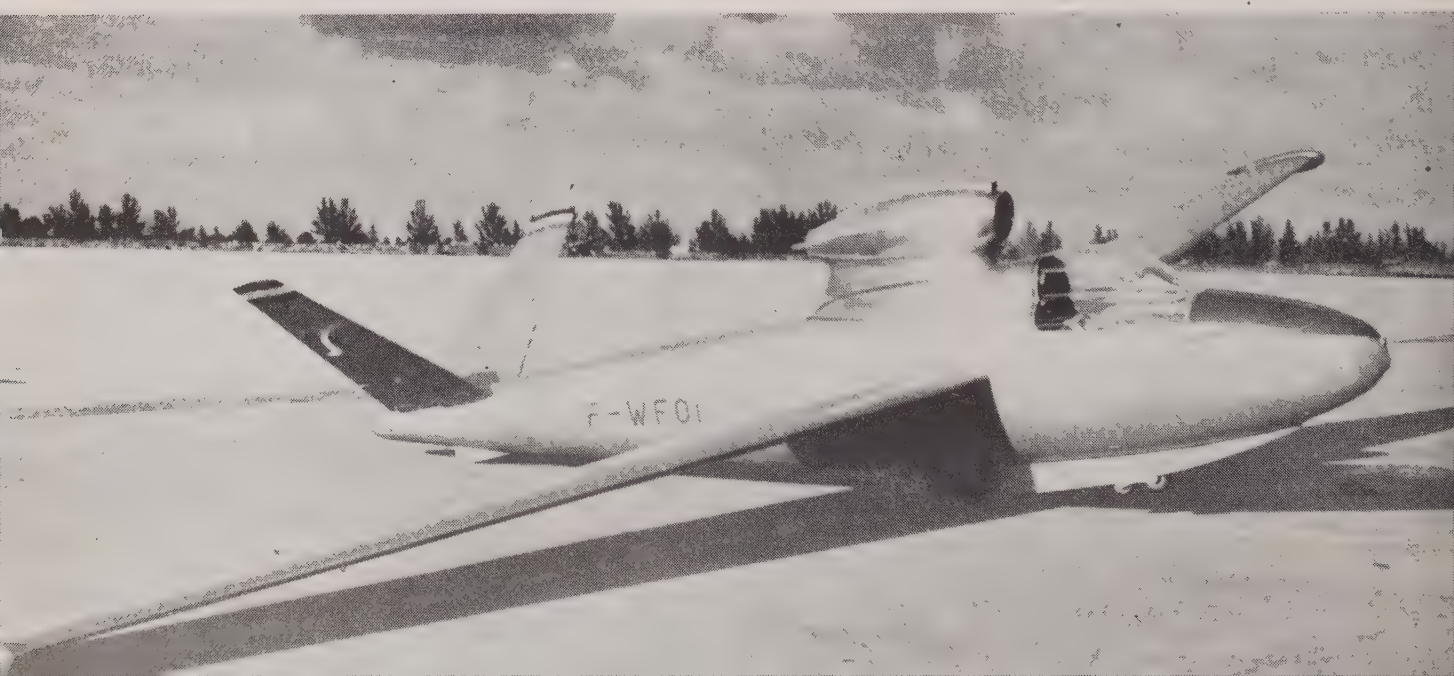
The Cyclone — Jet Lightplane

By L. M. HORTON

THE Fouga *Cyclone* (CM-8-R 13) is not only the first jet-propelled lightplane but it represents the first in a series of planned jet-equipped models. Future direction, progress and departure from the conventional in private aviation was evident in the first excellent flight exhibition of this French production in America, at the recent All-American Air Maneuvers in Miami, Florida.

Shipped over on the *Ile de France*, the "Pimene", as this *Cyclone* model is called, was trailer-towed to

AIRFRAME was developed from the CM-8 glider. On ground, the jet *Cyclone* rests on one wing-tip skid and small wheels



TURBOMECA jet unit *(right)* rests in pusher position atop fuselage. This unit delivers about 225 pounds static thrust

Miami and then re-assembled in the hangar at Opa Locka Airport.

Propped up by its wing-tip skids, which resemble tip-tanks on an F-80, the *Cyclone* looked like a sleek, silver, high-performance sailplane with a small engine atop the fuselage. Actually, the airframe of the *Cyclone* was developed from the glider CM-8, so that the high "lift-drag" ratio was maintained.

The ship itself is an all-plywood cantilever mid-wing type, fitted with flaps and metal dive brakes. These dive brakes consist of two opposing rows of quarter-moon sections which, when released, meet above and below the wing to form a single row of semi-lunar spoiler members. The plane has a V-shaped tail unit and skid beneath. Fuel tanks are in the wings, and carry 26.5 gallons. These tanks supply fuel for about an hour of jet flight.

The landing gear consists of a single fin under the fuselage with one large wheel under the cabin and two smaller wheels in tandem toward the front. These are equipped with brakes.

The ship's over-all specifications are: length, 21 feet 10 inches; wing-span, 42 feet 7¾ inches; height, 5 feet 10 inches; area, 140 square feet. Aspect ratio is 13. Empty weight is 805.4 pounds, gross weight, 1,182 pounds.

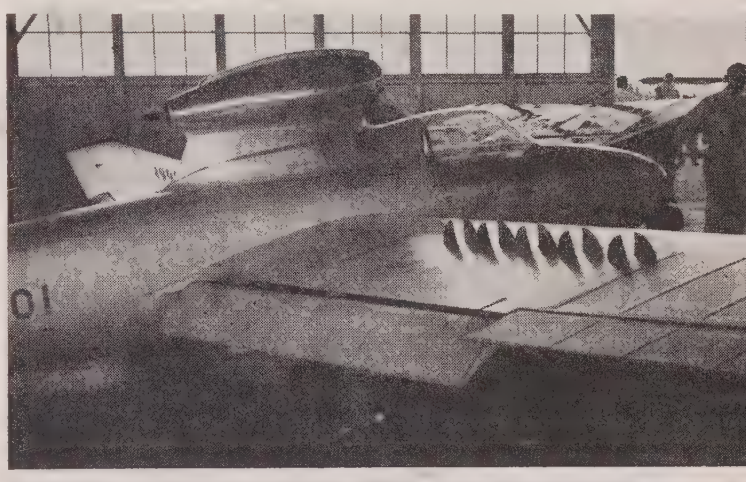
The single-seater cabin has a plexiglas canopy, a single unit which is secured flush with the fuselage contour after the pilot is seated. The head-rest and seat cushions are plastic covered.

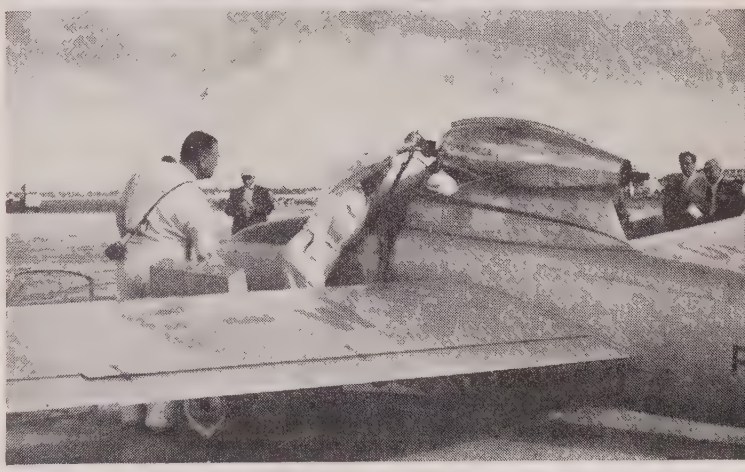
To the pilot's left, there is a red-ball-topped throttle, to the lower left are the handbrake and spoiler levers. On the right, there is a wheel for varying degrees of flap application, and a ball-topped lever for trim-tab adjustments. Engine-reactor fuel-selector settings are achieved through a long "push-pull" rod which has three positions: forward position indicates the valve is closed; center position indicates gas-feeding; rear position permits kerosene supply.

Rudder bars are the conventional type, but the control stick has an interesting feature: it is a jointed unit, with the joint located at a position slightly above the pilot's knee. This provides clearance and unrestricted action in aileron operation. The stick acts as a single unit for elevator operation.

The instrument panel is a simple one, carrying only basic gages. In the center at the top of the panel is a rudder position adjustment pull-knob. Below this, there are two rows, each containing four instruments. In the first (*Continued on page 41*)

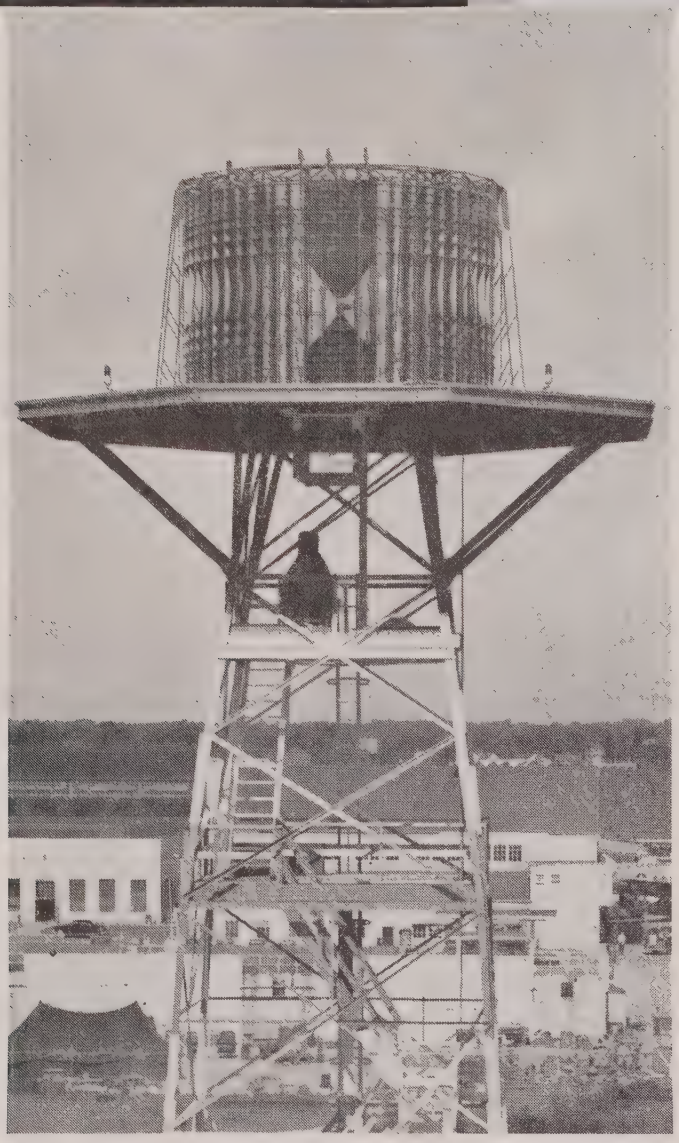
DIVE BRAKES, here *(below)* in "on" position, consist of quarter-moon sections forming semi-lunar spoiler members





JET UNIT is started by a charge from a portable battery cart. This small axial-flow turbojet unit weighs 110 pounds

NOSE PHOTO of *Cyclone* gives close-up view of its landing gear. Also note dive brakes above and below the wing



ANTENNA for new precision omni uses lens to direct microwaves; keeps waves off ground, reduces ground reflections

Microwave Lighthouse

By COL. N. F. SILSBEE

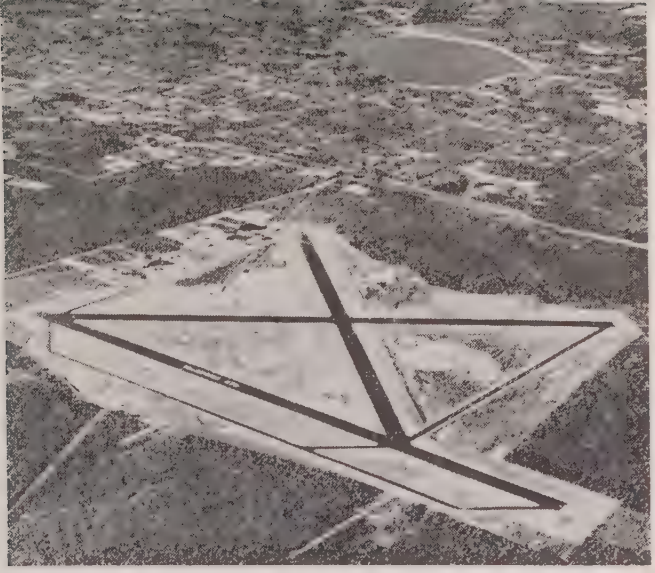
THE merest glance into a crystal ball indicates that 1955 will see much heavier air traffic than at present. General Milton Arnold of the Air Transport Association reports an annual increase of about 5 per cent since the end of the war, and with present facilities, this is already causing considerable concern. Planning for the expected requirements five years hence is already well along, and one of the most promising aids now on the horizon is a precision omni-directional radio range for highly congested terminal areas.

Sperry engineers Joe Lyman and George Litchford, in cooperation with USAF's All-Weather Flying Division at Wright-Patterson and with Watson Laboratories, are the ones responsible for the development.

The heart of the system is a "microwave lighthouse." The lens, mounted on a 75-foot tower, works on the same theory and does the same job as a Fresnal lens used in lighthouses. Here, however, it consists of metal slats instead of glass and directs toward the horizon continuous radio waves (CW) six centimeters long (in the microwave band) instead of visible light waves. By keeping the radio waves off the ground, the lighthouse lens reduces ground reflections which would impair accuracy of the system.

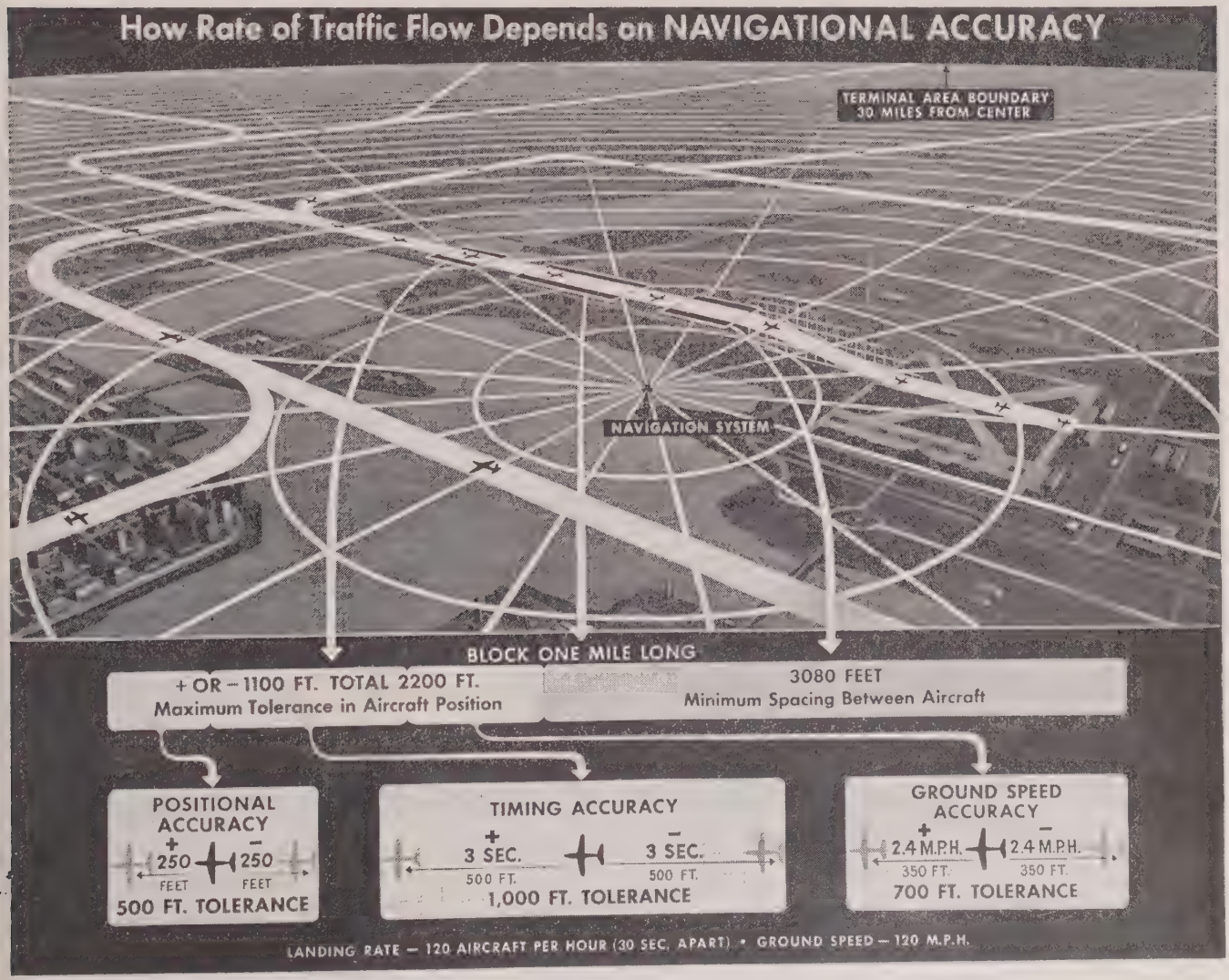
This sounds easy, but to achieve this result, several technical steps were involved. Microwave developments during the war, because of the ease with which it was possible to obtain sharp beams, have been able to provide omni-azimuth systems of

EXPERIMENTAL OPERATIONS by Sperry on microwave took place at MacArthur Field. First tests were run in a bread truck



MACARTHUR FIELD, located on Long Island, is familiar landmark to pilots flying the Atlantic. Precision omni-directional range tests made in converted truck *(right)* showed an accuracy of one-half degree, plus or minus

a high order of accuracy—but with one fundamental limitation. (Azimuth, from an old Arabic root, means your *bearing*, measured from the north, clockwise, from 0° to 360°). A pencil beam was made to rotate like the hands of a clock by mechanically turning the radiating structure. This was too slow for this particular purpose. An airplane which is swept only a few times (*Continued on page 44*)

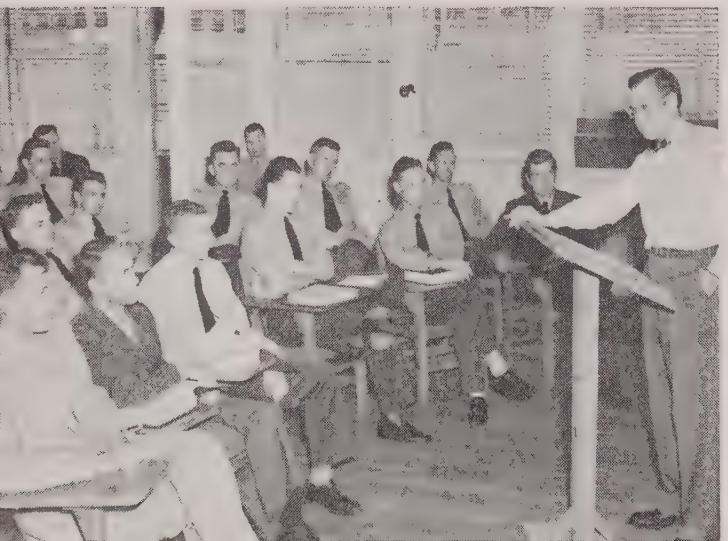

How Rate of Traffic Flow Depends on NAVIGATIONAL ACCURACY
TERMINAL AREA BOUNDARY
30 MILES FROM CENTER
NAVIGATION SYSTEM
BLOCK ONE MILE LONG
+ OR – 1100 FT. TOTAL 2200 FT.
Maximum Tolerance in Aircraft Position
3080 FEET
Minimum Spacing Between Aircraft
POSITIONAL ACCURACY
+ 250 FEET
– 250 FEET
500 FT. TOLERANCE
TIMING ACCURACY
+ 3 SEC. 500 FT.
– 3 SEC. 500 FT.
1,000 FT. TOLERANCE
GROUND SPEED ACCURACY
+ 2.4 M.P.H. 350 FT.
– 2.4 M.P.H. 350 FT.
700 FT. TOLERANCE
LANDING RATE — 120 AIRCRAFT PER HOUR (30 SEC. APART) • GROUND SPEED — 120 M.P.H.

Test Pilot Training

TEST PILOTS out of Navy School log time in everything with wings in their job to make fighting planes safe to fly

Test pilots are aero engineers who are expert flyers via experience

TEST SCHOOL at Patuxent River includes airmen from the Navy, Marine Corps, Air Force, RAF, and even civilians



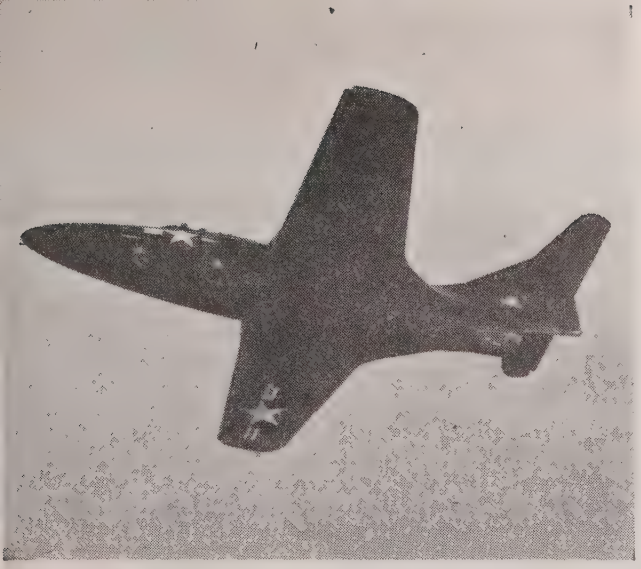
THIS is the story of the education of Lieutenant Joe Doaks, Hot Pilot, U. S. Navy.

And the story of the U. S. Navy Test Pilot Training School, where he was educated.

Joe Doaks had a good war record—while not exactly an ace, he at least had never become a statistic. He had an accident-free file in the Bureau of Aeronautics, good fitness reports, 1500 hours in carrier planes, and a hundred carrier landings. He loved to fly. He owned a BS degree in Electrical Engineering, and he had been in the top third of his class in college. After the war he had remained in the Navy because he wanted to fly and because it looked cold on the outside. He kept up on his Tech Orders, religiously read all publications on single-engine planes, and flew every fighter the Navy had.

Joe was not given to false modesty. In time he became convinced that he had little if anything to learn about the care and feeding of carrier aircraft.

By LT. (jg) HANK SEARLS, USN



JET FIGHTERS and all other prototype aircraft are "wrung-out" by test pilots before okayed to go into production

STUDENTS sitting it out in school ready-room are flyers with thousands of hours. These are *(left to right)* Flt. Lt. Ennis, RAF; Capt. Payne, AF; Cmdr. Duncan, USN; Capt. Herndon, USMC; Flt. Lt. Murley, RAF. Some fly 'copters

He was flying jets off the *USS Princeton* when he learned he had been recommended for the Test Pilot Training School at Patuxent River, Maryland.

This pleased Joe. He knew all about test pilots from the cigarette ads. He saw himself nonchalantly pulling through an outside loop at Mach 2, picking up his mike, and telling an anxious group of admirals in the tower that the plane was okay to buy. Besides, he liked the Navy and felt that his experience would be useful to the younger pilots in the school, and possibly to the staff. So he assured his wife and several small admiring Doakses that the testing of aircraft, while lethal for the tyro, would be duck soup for Joe. Then he polished up his golf clubs for a tour of shore duty.

The clubs are gathering dust in the basement of Joe's house in Patuxent Park. Some sunny Saturday mornings, turning base in a lumbering PBY, Joe glances out of the cockpit at the beautiful golf course and a lump comes into his throat.

Mrs. Doakes is resigned to spending her nights drawing performance curves for studious Joe.

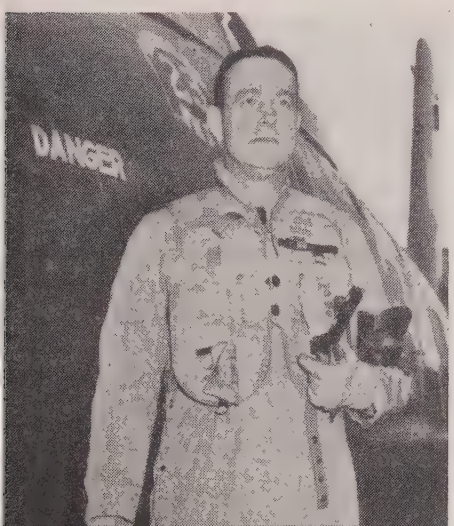
The little Doakses go to bed at six so that Joe can study.

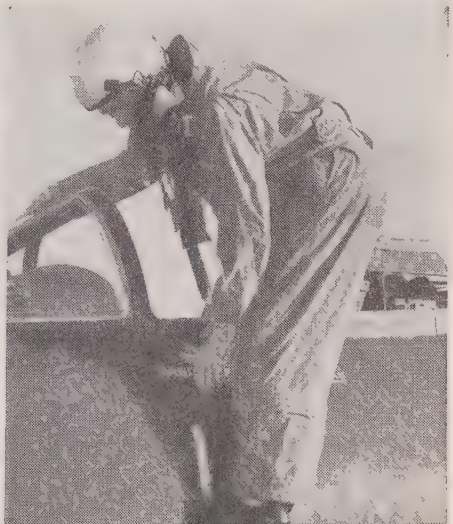
Joe Doaks, Hot Pilot, has cooled off considerably. Slowly the realization has come to him that although he had for some time (*Continued on page 46*)

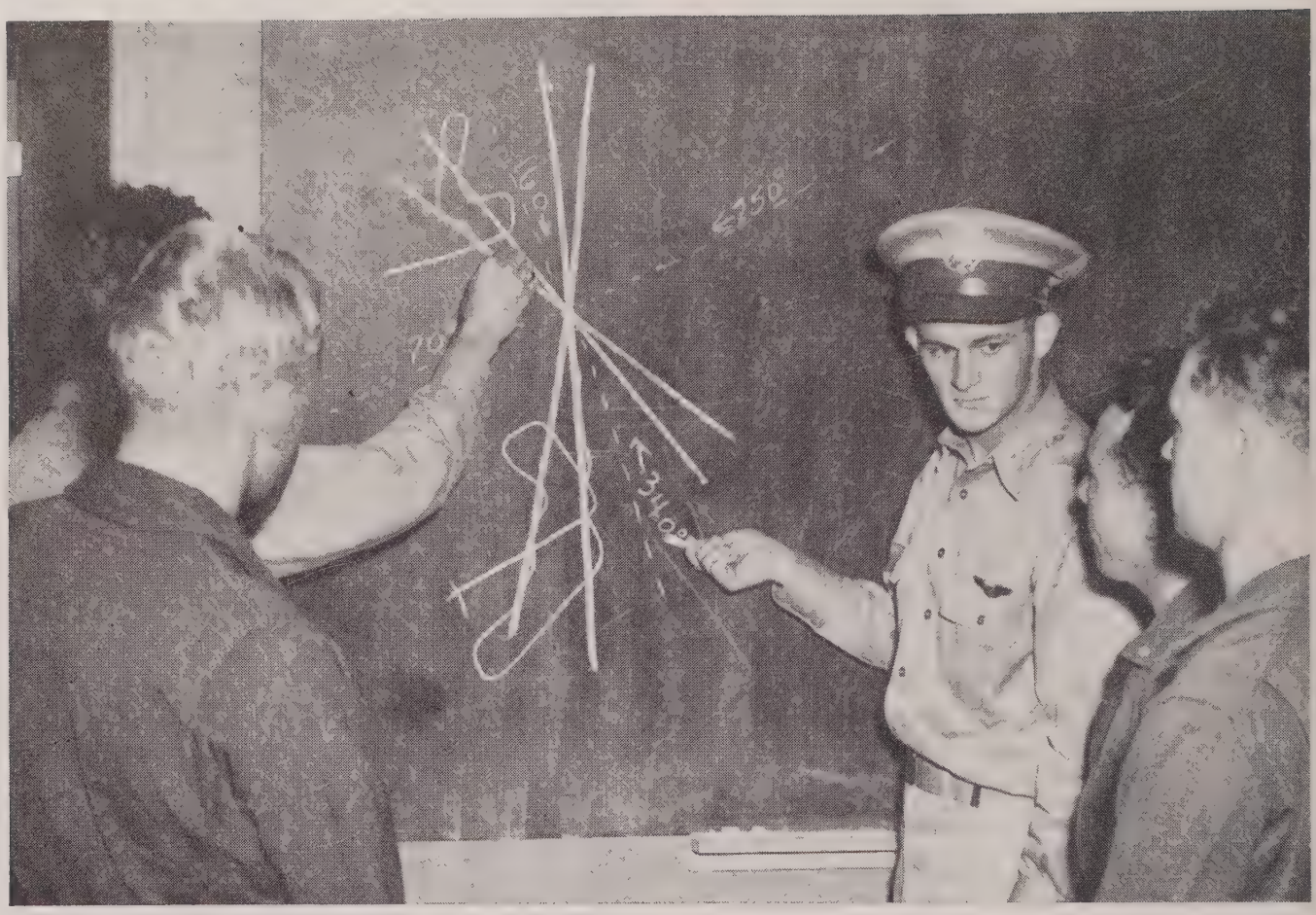
NAVY'S foremost test pilot is Capt. Trapnell, the C.O. at NATC

PILOT who ran series of power-required runs on F7F is Lt. Reuter

NAVY Lt. Cmdr. N. Bigelow climbs out of *Banshee* after test







AIR FORCE CADETS are taught several systems of orientation. No one system will work under all wind conditions

NEVER GET LOST

RANGES installed and operated by CAA for airway travelers operate on low-frequency; will be superseded by omni

By BEN ROBIN

WHILE stationed at the New Castle Army Air Base, near Wilmington, Delaware, during the last war, I was knighted with the dubious honor and title "Director of Training." My students, the other pilots on the base, were not exactly junior birdmen. Many had been airline captains, flight instructors, and charter pilots before signing up with the Air Transport Command. These A.T.C. officers didn't go for the schooling idea at all.

You can imagine the chorus of cat-calls and boos that greeted my arrival at the instructor's rostrum one warm, spring, morning in June. Several hundred lieutenants, captains, and majors glowered at me from behind sleepy eyes and unshaven faces. The base M.P.'s had routed out a mess of the most experienced pilots Uncle Sam had conned into

RADIO RANGE STATIONS transmit signals enabling the pilot to follow signal to airport or, if lost, to orient his position

an army uniform. (Many of us were originally promised permanent civilian status.) There was no mistaking the mood and interest of my audience as I called for silence and attention. I was outranked, outsmarted, and out of order, so far as they were concerned.

"Gentlemen, may I please have your attention," I pleaded.

The hum of voices and turning of heads (away from me) only continued.

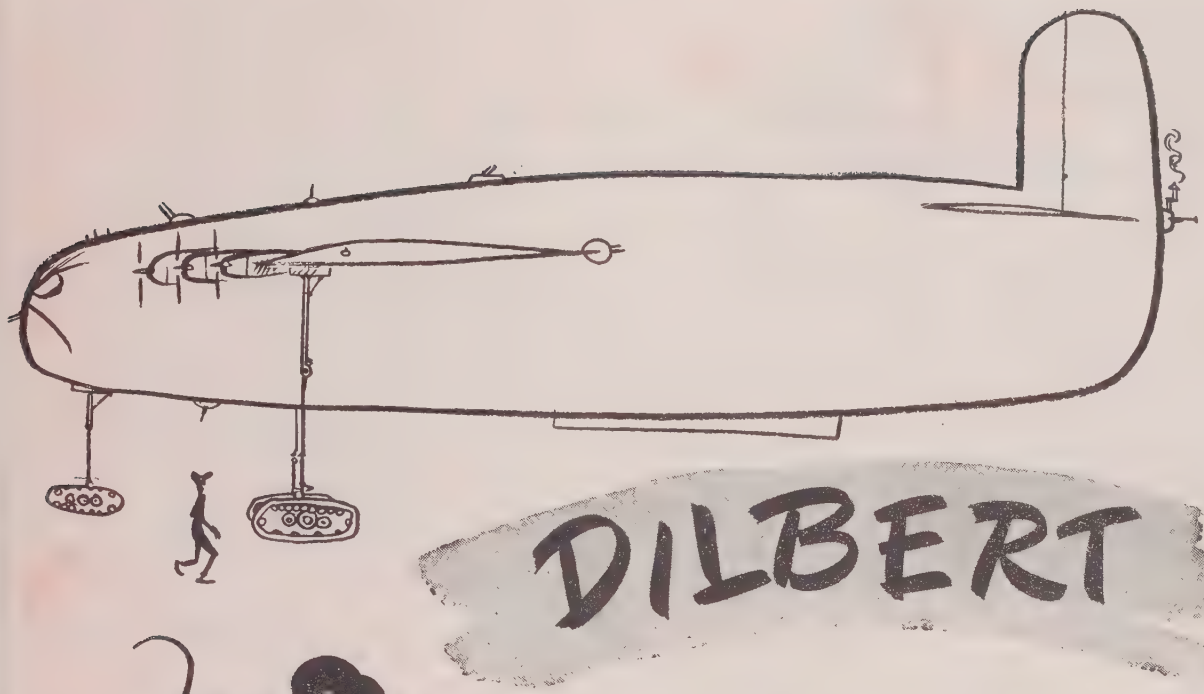
"All who can answer one question correctly may be immediately excused from this morning's class," I shouted above the din.

I had a silent attentive audience in a fraction of a second.

I explained that I knew how the boys felt. After all, I had been one of them until a few days ago. This new position had been wished on me. I hadn't asked for it. I explained that in the future, classes would be divided in smaller groups. Only advanced subjects, in which the pilots were interested, would be taught. Any student who could make a passing grade of 70 per cent in a preliminary test on each subject could be excused for that period. An immediate cheer went up that could be heard at the German front. (*Continued on page 45*)

ORIENTATION SYSTEM, any one of many, would work all the time if all ranges were square and wind never blew hard

"Dare-Devil Dilbert makes his last 'Polar' flight!"



DILBERT

By S. H. Warner and R. Osborn

The crash occurred while Dilbert was going through his stunt repertoire. When he pulled out, after completing a loop, the entire fabric of the right wing came off. Of course, he lost control and had to finish the flight via parachute.

Investigation disclosed:

a. The left wing was in perfect condition.

b. The retrieved fabric of the right wing was not flabby.

c. Both wings had been newly covered within the year.

By process of elimination, it looked as though the lacing cord had let go.

When questioned, Dilbert advised that he had last inspected the wings some three months previously. Then he smiled (*Continued on page 58*)

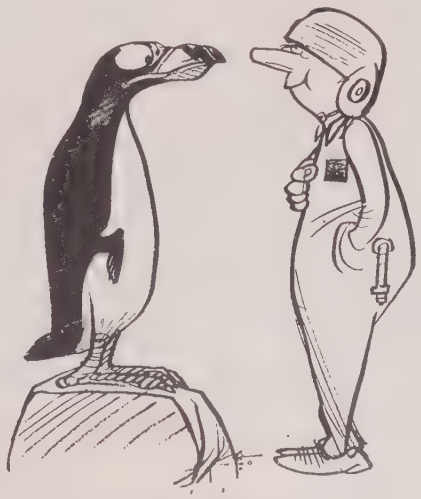
Mouse Wrecks Airplane—I know this one is a bit hard to swallow, but don't take my word for it. The Civil Aeronautics Board has the official record to prove it—and I'm just passing it on.

1. When two aircraft are on crossing courses at approximately the same altitude, which one has the right of way?

2. If you are in position to take off and receive a red light from the tower, what should you do?

3. If you are lost and faced with a forced instrument let-down over terrain you do not definitely know, what should you do?

(Answers on page 58)



"You mean to stand there and tell me they haven't clipped your wings yet!"

Operational Engineering

Engine Instruments

INSTRUMENTS installed in airplanes, whether private, commercial or military craft, are at times treated by pilots and mechanics with a degree of misunderstanding and contempt that is unbelievable. "The instruments are off," or "the gage wasn't working," has always been a sort of excuse for everything from false emergency landings to over-operating a plane for the thrill of it. Of course, instruments aren't infallible; they are subject to breakdown, damage and reading variations, but often the reasons for defects are traceable to faulty installation or careless maintenance.

Engine instruments are probably subject to more abuse than others, both from vibration, heat and fluids as well as manhandling. Inexperienced hands messing around in engine compartments, tightening this or bracing that, have been known to bend instrument tubing into unbelievable shapes without realizing that some instruments may be mechanically, electrically or fluid-pressure operated and the same treatment cannot be accorded to all without drastically affecting the readings. Following are descriptions of the basic working parts of standard engine instruments with some installation and maintenance tips to make for better care of these aircraft "muscle-nerve" indicators.

Tachometers

The instrument dial that receives maximum attention from any pilot is the tachometer indicator. A mechanically-driven centrifugal tachometer drive connection of the engine. Basically, the instrument consists of a flyweight unit which is spun by the drive shaft. As the turning speed increases, centrifugal force moves the flyweights outward. The flyweight movement is proportional to the speed and it is measured and indicated as a reading in rpm on the dial face by the revolving pointer. The tachometer drive connection at the engine operates at one-half engine speed.

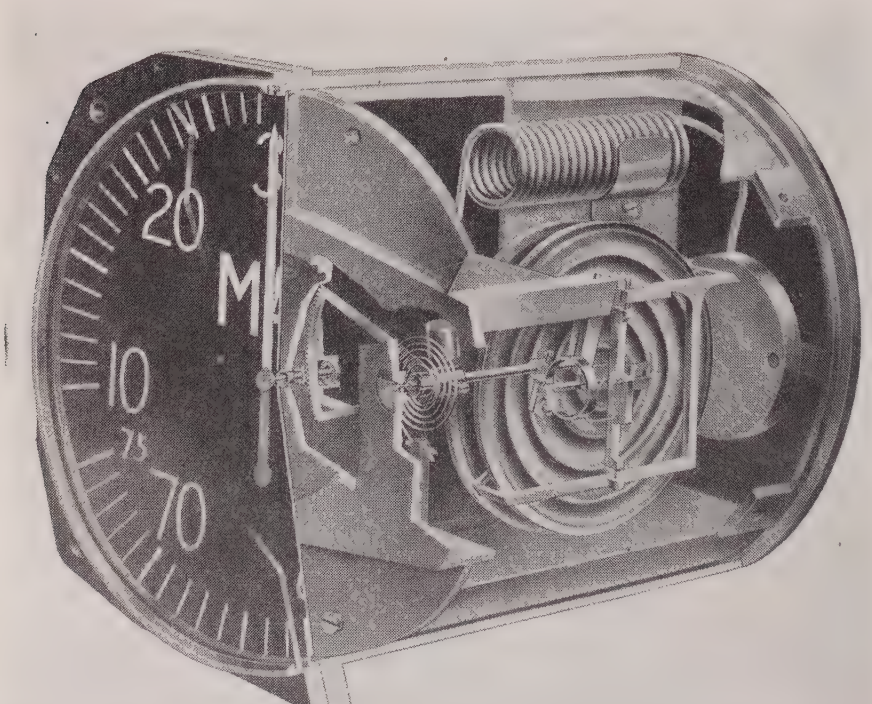
Electric tachometers take over where the distance between engine and panel or angles of installation limit the use of mechanical connectors. The engine part of the installation is an AC generator with a permanent magnet rotor. It may be pad or screw mounted, depending on the engine connection. The generator is connected by a three-wire cable to the indicator. The current from the generator energizes the indicator's synchronous motor, causing it to run at a speed proportional to the engine speed. A permanent magnet attached to the motor shaft in a bronze alloy drum (*center in cutaway*) creates torque magnetically, tending to rotate the drum in the same direction. A calibrated hairspring tends to restrain this movement which registers on the dial as an accurate indication of engine speed.

The Kollsman Magnetic Tachologs with built-in engine hour counters are direct indicating units with flexible drive-shaft connections. The indicator is operated by means of a magnetic disc rotor driven through a gear transmission by the drive shaft. Induction discs above and below the rotor and mounted on the same shaft are caused to rotate by the eddy currents produced by the magnetic rotor. The rotation is restrained by a calibrated spring. The engine hour counter is based on normal operation at 2,000 rpm.

Kollsman warns that no bends should be made in flexible drive shafts within three inches of either terminal. Bends of less than six inches radius should be avoided. Oscillations of indicator pointers are usually the result of improper installation of the shaft connection to the engine.

Caution: When installing the connector at the engine drive, check the direction of rotation when looking at the engine outlet. Some are clockwise and some counter-clockwise and take different installations.

MANIFOLD PRESSURE GAGE, shown here in cutaway, is the standard vapor-proof type



Manifold Pressure Gages

Standard manifold pressure gages are connected directly with the intake manifold of the engine and provide an indication of the vapor pressure at this point. In the standard vapor-proof type (*see cutaway*) the pressure is conducted through ⅛-inch tubing from the engine and is introduced through the rear of the instrument case and through the capillary tube coil at the top of the case, then to the inside of the diaphragm in the center of the case. The diaphragm is an evacuated unit which expands with decreases in atmospheric pressure, thus automatically compensating for altitude.

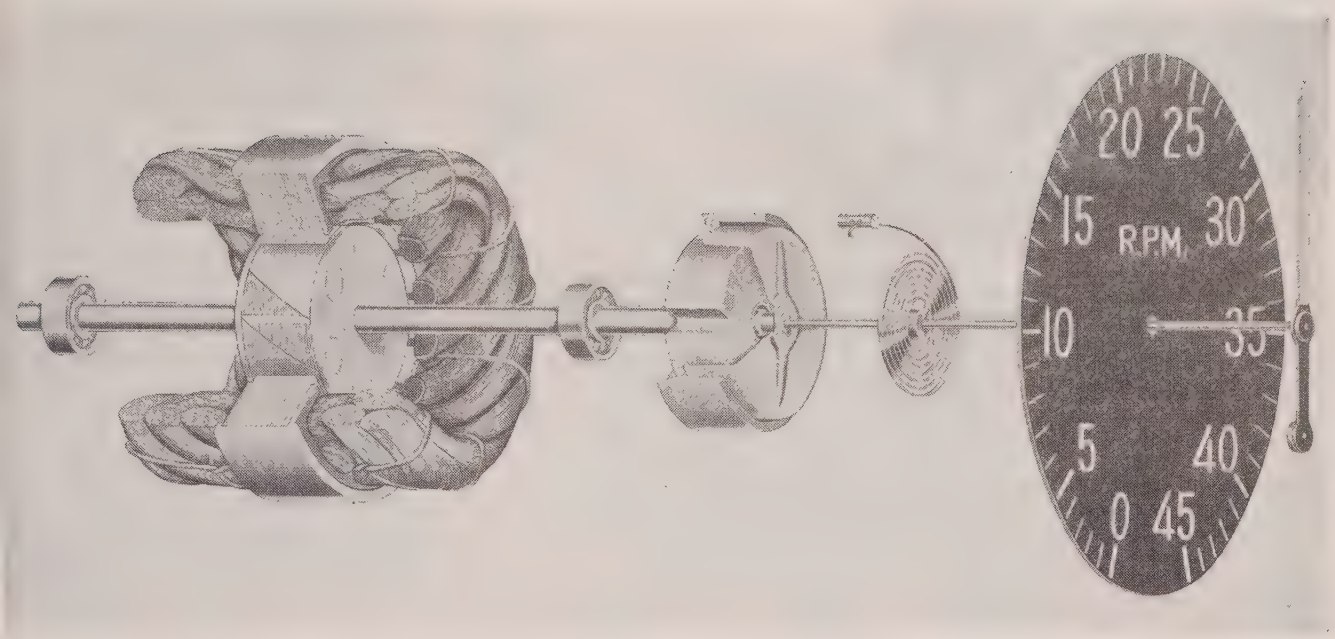
Oil and Fuel Pressure Gages

Kollsman standard fuel and oil pressure gages are Bourdon-tube mechanisms. This is a hollow bronze tube formed into an arc, with one end anchored and the other free to move although connected to a bronze lever arrangement that moves the pointer on the face of the instrument. Fluid pressure entering the tube at the anchored end forces the tube to bend, resulting in a movement of the mechanism and the pointer.

Engine Thermometers

The Kollsman type of standard engine thermometers have pressure responsive mechanisms of the Bourdon-tube type. A liquid-filled bulb, inserted in the engine at the point where the temperature is to be measured, is connected by flexible capillary tubing to the instrument. A change in temperature causes in increase or decrease of pressure through the tubing, causing a reaction in the instrument similar to the set-up described for the oil and fuel gages. The thermometer may be used to measure oil temperature, coolant temperature (in liquid-cooled engines) or carburetor air temperature, with properly calibrated dials.

The capillary tubing used for this type of instrument should be carefully installed without sharp bending or kinking. The tubing should be taped securely to fuselage, wing or engine structure at points eight to 10 inches apart to prevent oscillation. Excess tubing may be coiled and taped to a



TACHOMETER above is an electric type. The engine part of installation is an AC generator with a permanent magnet rotor (drum in center)

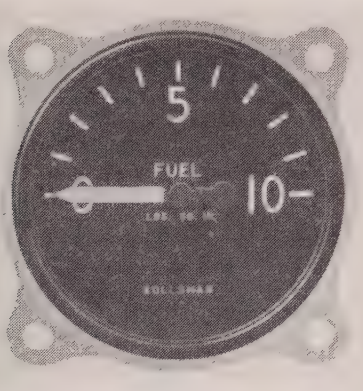
support, but the diameter of the coils should be at least three inches but not great enough to allow oscillation of the free side of the coil. The tubing should not be taut between taped points between the engine and mount or between mount and fuselage. At these points only it should be looped to make allowance for movement between aircraft components. Where the tube passes through the firewall or other shields it should be protected with rubber grommets. At any point where it is fastened to the fuselage frame or engine mount a layer of tape should be placed to cushion the tubing.

Maintenance

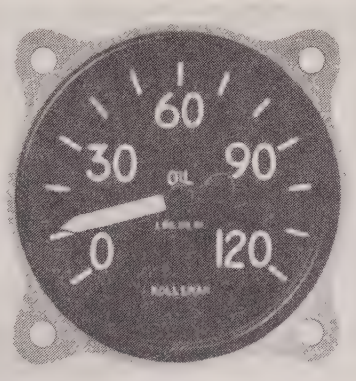
Basic instrument maintenance in the aircraft is limited to reasons for removal and replacement. No one but a licensed instrument technician should attempt to repair an instrument or open a case for adjustments. Generally, the pilot or mechanic should check for luminosity of dial and pointer paint, check the instrument for security of mounting and the cover glass for cleanliness, marks, looseness or cracks. Leads and lines should be checked for security of mounting and evidence of chafing and kinking (in those that utilize capillary tubing or mechanical linkage).

Those instruments that have a mechanical zero should be checked for that position when the engine is not operating and adjusted if an external adjusting screw is available. Naturally, unusual oscillation or obviously defective readings call for further inspection of components, and removal and replacement where the reason is not externally indicated.

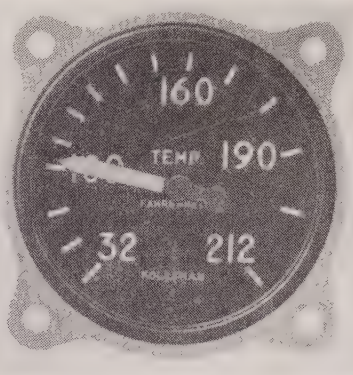
Jerry Leichter



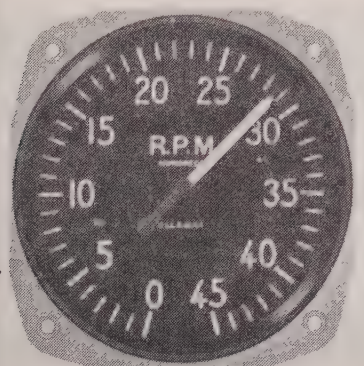
FUEL PRESSURE *(above)* is Bourdon type. The RPM indicator *(below)* is standard electric tachometer, like cutaway above

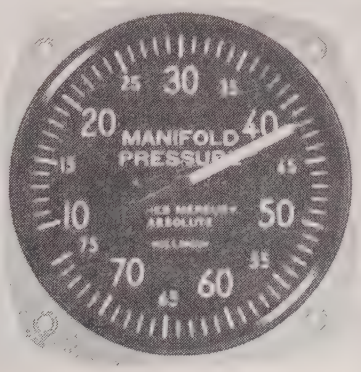


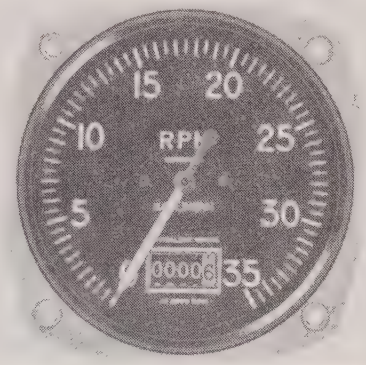
OIL PRESSURE *(above)* is also Bourdon type. Manifold Pressure gage *(below)* is connected directly to intake manifold



TEMPERATURE gage is for oil or coolant temperature *(above)*. Magnetic Tacholog *(below)* has built-in engine hour counter







CAOA REPORT . .

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. The CAOA headquarters are located at 444 Madison Avenue, New York 22, N. Y.

CAA Radio Communicators

Pacific Mills' pilot Roderick R. ("Rod") Elliott has reported to CAOA headquarters a condition that, unless properly corrected, could have serious consequences. As a result of a $1.5 million cut by Congress in the 1949-50 CAA budget in the interests of economy, a considerable number of experienced radio communication personnel have been dropped since July 1, 1949. While this applied more or less to the country as a whole, a heavy proportion (some 65) came out of Region 2 (southeast) where Rod's company and many of our other members have extensive operations.

In order to get all the facts and to call the matter to the attention of topside in CAA, a letter was sent to Delos W. Rentzel, Administrator of Civil Aeronautics, with copies to Deputy Administrators Donald W. Nyrop and Fred Lee, and to Charles F. Horne, Director of Federal Airways.

We stated that it appeared to our Association that the elimination of such a considerable number of experienced radio communicators would have an adverse effect on the safety of all non-scheduled aircraft operations. Also that while economy is always a praiseworthy objective, it was our opinion that it should be exercised in directions which would not have such a direct effect on flying safety.

A telephone call to Mr. Nyrop and a letter received a few days later informed us that Congressional action made it necessary for the CAA to reduce the personnel complements of Class I and Class II communication stations from six-man to five-man crews. As a result, certain adjustments are being made to maintain the efficiency of the CAA communication stations, including the allowance of overtime at a few of the busier stations. Tower operators were not affected by the action, nor is there any prospect of a further cut in communications personnel in fiscal 1950-51.

This last point is contrary to another report in CAA circles, and as we go to press we are continuing our effort to dig out all the facts. We shall report further on this within the near future.

New Members

The month of January added five new members to CAOA bringing the total to 70. Four were made Regular members, and one was approved as an Associate member. Here are the vital statistics:

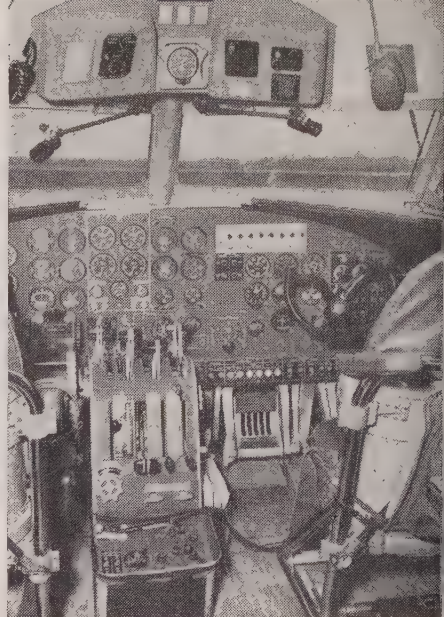
Honolulu Oil Corporation of San Francisco, producers of crude oil and gasoline. This company has operated a Beech D-18S since September 1946, now based at the Oakland Airport. Pilot (in charge of company aviation operations) is Forest M. Johnston of Alameda. Accompanied by his flight engineer, Mr. Johnston visited CAOA Headquarters in New York and the Operations Office at Teterboro Airport on his first trip East after the company's application had been accepted.

International Harvester Company of Chicago has operated aircraft since August 1947, and presently operates a converted Douglas B-23, based at Midway Airport, Chicago. The company will be represented at CAOA meetings by Mr. Gerard J. Eger, Secretary. Their pilot is Bill Dotter.

The Babb Company, Inc., New York and California (Associate member), deals in airplanes and aviation equipment in both the domestic and foreign market, and has operated its own aircraft since 1946. Its Beech D-18S is based at Grand Central Airport, Glendale, and pilot is William H. Oswald, Jr. Mr. Edward Lund, vice president (N. Y.) is company representative for CAOA.

The Gannett Company, Inc. of Rochester, operates the chain of Gannett newspapers. The company has been operating aircraft as an aid to business since 1934, and presently operates a Lockheed *Lodestar* and Beechcraft Model 18, based at the Rochester Municipal Airport. Chief pilot is Lt. Comdr. Russell ("Russ") Holderman, well-known National Air Race pilot of some years back.

The Joyce Lumber Company of Chicago has operated a Beechcraft A-35 *Bonanza* during the past year, based at Sky Harbor Airport, Northbrook, Ill. Robert Myers is company pilot. Mrs. Beatrice Joyce Kean, principal owner of the business, will represent the company at CAOA meetings.



PILOT'S OFFICE features this instrument set-up in cockpit of new Swedish *Scandia*

TWIN BEECH belonging to Shamrock Oil & Gas Company, Amarillo, Texas, gets its 100-hour check. Its pilot, F. M. Johnson *(in white sport shirt)*, confers with Southwest personnel

Cyclone-Jet Lightplane

(*Continued from page 29*)

row, reading from left to right, are: tachometer, altimeter, rate-of-climb, and cylinder pressure gage. In the second row: revolutions of the reactor, turn-and-bank, compass, and oil-temperature gage. Below and in line are two fuel temperature gages. It's a neat panel, definitely laid out for pilot's convenience.

The unique feature of the *Cyclone* is the Turbomeca TR 011 jet unit, which rests in pusher position atop the fuselage and aft of the cabin. It is a small turbojet unit (probably axial flow with a single-stage compressor), weighing only 110 pounds. It consists of a new form of rotary fuel injector in combination with an annular combustion chamber. It delivers from 200 to 225 pounds static thrust, or—figured by formula and translated to horsepower—between 85 and 90 hp.

Compliance with the French government certification requirements means type-testing an engine for 150 hours duration. The Turbomeca completed the test conditions: 225 pounds static thrust for 15 hours, 75 hours at 178 pounds thrust, and the remaining 60 hours at 125 pounds thrust. To date, they have overhauled the engine after each 300 hours' performance, but thus far have found no failures.

For operation, in which the fuel used is a mixture of 3 per cent thin-grade oil and kerosene, the fuel-selector rod in the cockpit is set on "GAS". (Easier starting is achieved with use of gas.) A portable battery cart is brought up alongside the ship. One wire is attached to a cockpit control which is internally connected with a small spark plug on the combustion chamber. The other wire is attached to an extension rod which is inserted and secured into the central shaft by a "dog." The first "charge" starts the compressor rotating and the necessary air is taken in. At the same time fuel is sprayed into the combustion chamber. When rotation of the compressor has reached about 4,000 rpm, the pilot presses the cockpit control for ignition of the fuel, which in turn brings about the rotation of the turbine wheel.

At peak thrust, the gear rotates at 30,000 to 35,000 revolutions per minute. The selector is then set for "KEROSENE" for jet take-off. At the end of flight, "GAS" setting is again resumed to burn out remaining deposits in the engine. Due to the V-shaped tail, no aerodynamic disturbance is caused by the outlet of burned gas.

At the present stage of the experiment, there is no re-starting mechanism. Once the engine is shut off, the soaring properties of the ship take over. Future aims are to provide the models with a re-starter mechanism that will operate when jet power is again desired. They also plan for a retraction mechanism so that the turbojet may be housed in the fuselage during flight when soaring is desired. Provision of a two-place cockpit would seem practical, as well.

Mr. Marcel Doret, one of the managers at the Fouga Aircraft plant at Landes, France, gives some interesting performance data: the ship's service ceiling has proved to be about 28,000 feet. This altitude has been reached in 55 minutes. At 16,000 feet, a rate of climb of 8.2 feet per second was recorded. The ship's normal rate of climb, after a take-off run of 1150 feet, is 800 feet per minute. Maximum cruise speed at sea level is 155 mph; top speed is about 190.

On the exhibition days, according to schedule, the ship was wheeled from the hangar with the mechanic "walking" the wing. Test pilot Nicole was already helmeted and seated in the cockpit.

For safety and economy, the engine was not started until they had reached the "standby" position just short of the operational runway. A small jet of flame shot out and promptly resolved itself into the usual shimmering heat-waves.

Once in take-off position the ship was released and the throttle slowly advanced for gradual feeding of fuel. Like most jets, the *Cyclone* took a long run and then assumed maximum climb. At about 1,000 feet, Nicole turned the ship steeply, opened her up and dived. Flying straight across the field before the stands, he was doing 180 mph or better. He pulled up sharply, lost airspeed, and throttled back. On the return trip across the field he demonstrated "slow flight". He lowered flaps and came back across the field at perhaps 50 or 55 mph. The glider aspect of the ship allows maneuverable, stable flight with seemingly full flying speed at these slow airspeeds. At this critical level there appeared to be no "mushing." This would indicate that for good sailplane performance, 55 mph would be the optimum airspeed at which to operate. The ship stalls out at around 47 mph.

Slow wing-overs and turns low to the ground were demonstrated, then the pilot added power, climbed back up and proceeded with his pattern. The landing glide and approach was steep and slow. With full flaps and dive brakes applied, the ship descended slowly and rolled smoothly onto the run way.

Test pilot and aerobatic champion, Fred Nicole, feels that the adaptation of jet power, in the form of a unit such as the Turbomeca, has much to offer everyone in private aviation, to both power and non-power pilots. He is most enthusiastic about the *Cyclone*, the resultant-product of the first of these experiments, because of its high maneuverability and full acrobatic ability.

The cost of the *Cyclone*, which would at present be a custom-made job, would run a little under $10,000, including import duty, etc. With any production volume, however, it might come down to as low as $7500. Cost of the jet unit alone runs about $2200.

This development will undoubtedly have tremendous appeal because of its versatility. It would solve the glider take-off and climb problem in search of "waves" for practical and enjoyable soaring.

The French envision it, as its capabilities would seem to indicate, as a new test medium for high-altitude weather research. They see it as a fast liaison aircraft for the pilot, and a training and aerobatic ship for the private sportsman. It is an interesting innovation, and a "first" in what promises to be a long line of experimentation in this field.

CYCLONE PILOT who demonstrated the jet airplane at Miami was France's Fred Nicole

C.A.P. News from Hq.

CAP CHAPLAIN is Lt. Col. Robt P. Taylor, a survivor of infamous Bataan Death March

Air Chaplain Appointed

Washington, D. C. Lt. Col. Robert P. Taylor, a survivor of the infamous Bataan Death March, was appointed Air Chaplain of the Civil Air Patrol. This is the first time the CAP has had a regularly appointed chaplain.

While Col. Taylor will maintain permanent headquarters in Washington, he plans to spend a great deal of time with various wings, or state units of the Civil Air Patrol.

Asiatic Students on Tour with CAP

New York, N. Y. The CAP acted as host in the U. S. to the foreign high school students whom the N. Y. Herald-Tribune brought to this country to participate in the International Students' Forum in New York City. At the completion of the forum, the CAP took over the job of showing the visiting students the "American way." The schedule included a flight in two USAF C-47's from Mitchel Air Force Base to Dallas, Texas, where the guests spent a week and lived in YMCA and YWCA dormitories. A two-day visit to Washington, D. C., followed the Dallas trip. Col. Taylor, new CAP chaplain, and Major Fred K. Mougey, Special Projects Officer, represented the CAP on the tour.

Girl Heads Knoxville CAP

Knoxville, Tenn. The CAP Squadron in Knoxville holds the distinction of being one of the few squadrons commanded by a woman. Moreover, she is only 21 years old. She is Lieutenant Shirley L. Farrar, a pre-law student at the University of Tennessee Evening School. Lt. Farrar spends a great deal of her time working with the CAP cadets, both boys and girls.

Perhaps sharing honors with Lt. Farrar is Col. Nancy Tier. Col. Tier is the only woman wing commander, and she heads the Connecticut Wing.

Crash Victims Mission

Stroudsburg, Pa. Climaxing a two-day search in New Jersey, New York and Pennsylvania, a CAP pilot and his observer recently located the two occupants of a lightplane lost on a flight from Florida to New York. The bodies of the crashed flyers, missing for 11 days, were spotted near Stroudsburg by Lloyd Imbt and Lawrence Lambert as they were flying over the Pocono Mountains. The two CAP-ers radioed this information to the State Police who hacked through the thick woods to the scene of the wreck. The occupants of the demolished airplane were on their way home to Schenectady, N. Y., for Christmas when the accident happened. Sixteen planes from the New Jersey Wing participated in the search.

Practice Drill

Massena, N. Y. In spite of bad weather, the North County Squadron of the New York Wing conducted a successful air-sea rescue drill in the Tupper Lake region, near Messena. The problem was to locate two imaginary pilots lost somewhere between Messena and Tupper Lake. The "lost" pilots were located on the shore of the lake by the second search flight to be dispatched by CAP. Supplies, snowshoes and food were parachuted to the "victims," and an L-4 landed nearby to offer aid. The two aircraft used were an Air Force L-4, and a Piper *Cub* loaned to the squadron by Airport Operator George Markham.

Frederick Aids Community Chest

Frederick, Maryland. In "Operation Life Nite" the Frederick squadron of the CAP helped put across the Community Chest drive for funds. Using a communication system patterned on those used in major disasters, Civil Air Patrol cars covered the city, each taking a sector and reporting back to headquarters as the Community Chest contributions were received. Would-be contributors were asked to turn on their porch lights as a signal for the cruising CAP cars to stop. Other members of the squadron were stationed in various parts of the city to receive contributions from passersby. These gifts were reported back to headquarters via walkie-talkie radios.

TYPICAL MANEUVER flown by Civil Air Patrol was this combined CAP military Police "Operation Traffic Control" in Mount Vernon, N. Y.

ALTIMETER FACTS

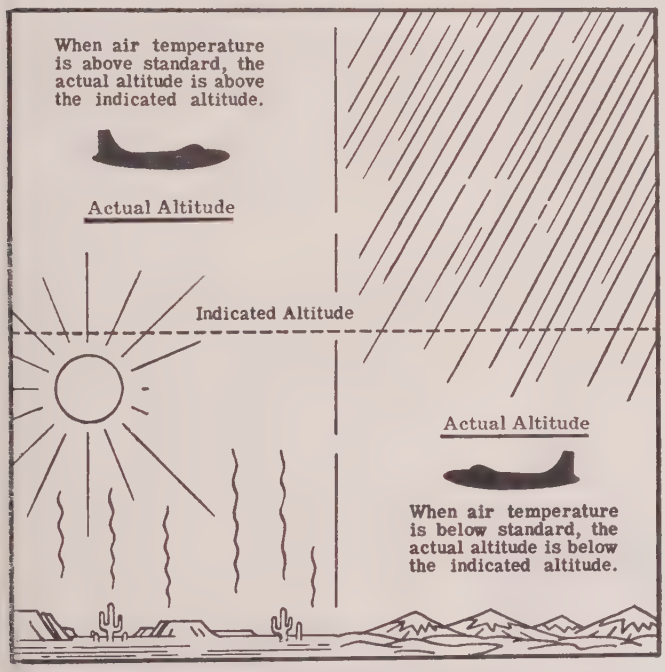
IT IS OF prime importance that pilots fully understand the errors altimeters are subject to. Listed below are a few of the most important facts about the altimeter and its ways.

THE BASIC FACTS

The altimeter is calibrated according to standard conditions of temperature and pressure. At sea level these standard conditions exist when barometric pressure is 29.92 inches Hg., and the temperature is 15 degrees C.

Because standard conditions seldom prevail, modern altimeters are equipped with an adjustable barometric scale. Setting the altimeter to the proper barometric scale reduces the possibility of incorrect readings.

The weight of the air column measured by the altimeter will vary because of changes in the air's density, which in turn is affected by variations in temperature and the flow of air over mountains. These are the factors which most frequently cause incorrect altimeter readings.


When air temperature is above standard, the actual altitude is above the indicated altitude.
Actual Altitude
Indicated Altitude
Actual Altitude
When air temperature is below standard, the actual altitude is below the indicated altitude.

COMMON ERRORS (DONT'S)

Listed here are the most common pilot errors in regard to altimeters:

(1) Failure of pilot to set correct barometric pressure into his altimeter before takeoff and to check reading against field elevation.

(2) Failure of pilot to adjust altimeter setting while flying on course.

(3) Failure of pilot to adjust altitude for temperature.

(4) Failure of pilot to read altimeter correctly.

REMEMBER

Altimeter settings are computed with an artificial scale based on sea level normals. The sum of errors mounts with the effect of wind, temperature, terrain, and storms. Failure of pilots to know terrain elevation, either because they did not check it on maps or because they were off course, has caused many crashes.

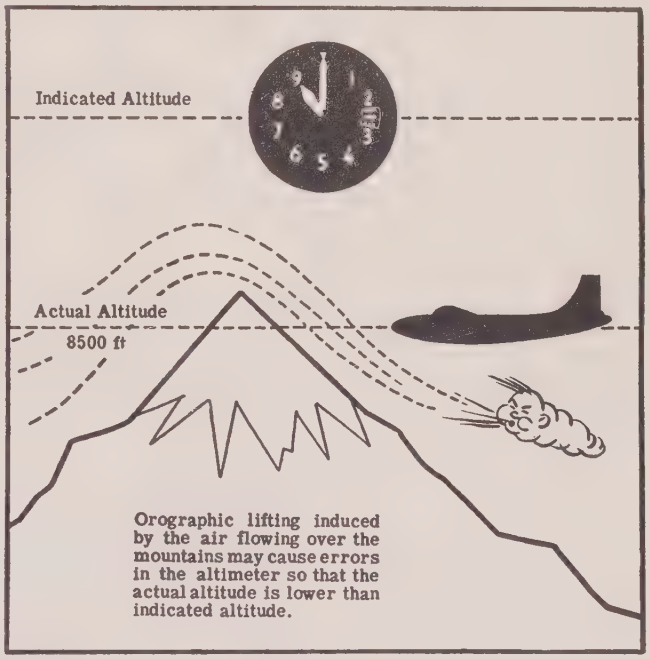
WEATHER EFFECTS

When flying into an area of higher barometric pressure, the actual altitude becomes higher than the indicated altitude, whereas when entering an area of lower barometric pressure the actual altitude becomes lower than the indicated altitude. The same is true when entering areas of higher or lower temperatures.

Venturi action or orographic lifting induced by the air flowing over the mountains may cause errors in the altimeter so that the actual altitude is lower than the indicated altitude. In extreme cases actual altitude may be 2500 feet below the indicated altitude.

In warmer than normal air a plane usually flies higher than indicated; in colder than normal air, lower. Operations in subzero weather with clear skies or over desert areas which radiate extreme heat will induce large errors between the actual and indicated altitude.

Squall lines and thunderstorms will cause major differences between true and indicated altitude because of fluctuating pressures. Altimeter errors are roughly proportioned to the intensity of the thunderstorms.


Indicated Altitude
Actual Altitude
8500 ft
Orographic lifting induced by the air flowing over the mountains may cause errors in the altimeter so that the actual altitude is lower than indicated altitude.

POINTERS (DO'S)

(1) Before takeoff obtain the latest altimeter setting for the field from the tower, then set the barometric scale on the instrument to this setting. The hands of the altimeter should then indicate the surveyed altitude of the field above sea level.

(2) During flight you must continually correct the altimeter by resetting the barometric scale according to the latest altimeter setting of the area in which you are flying. Request it from the nearest radio facility.

(3) Before landing, again request the latest altimeter setting from the tower and reset the instrument accordingly so that you can depend on its accuracy.

Before clearing for an instrument flight, be sure the altitude you have requested gives you sufficient terrain clearance over your entire route. Then keep your altimeter reading at this altitude. Don't make mental corrections and try to figure your true altitude. Keep your indicated altitude corrected by resetting your altimeter from settings given you over your radio check points.

Reprinted courtesy "Flying Safety" USAF publication.

Microwave Lighthouse

(*Continued from page 31*)

a minute by a pencil beam from the ground must have circuits which attempt to "remember" the elapsed time between successive sweeps of the beams. For accurate automatic flight paths, the intermittent nature of a single rotating pencil beam would cause serious limitations in the type of flight path which the aircraft's automatic pilot could follow.

To overcome this, a better technique for obtaining azimuth information in an aircraft was developed in 1940. A heart-shaped (limacon) radiation pattern is provided through a complete circle something like that of a sine wave. This limacon radiation pattern is caused to rotate at some predetermined speed, such as 1600 rpm. This results in the aircraft obtaining a sine wave whose phase is dependent upon the azimuth position of the aircraft. In order to measure this azimuth, a *reference* sine wave is transmitted in all directions (hence *omni*) with constant phase with reference to azimuth. An indicator in the aircraft automatically compares the antenna rotational signal to the reference signal, and the electrical phase angle represents the aircraft's physical azimuth position with respect to the ground station. This is the principle used in the VHF omni-range system, known as VOR (Visual Omni-directional Range), which is being installed by the CAA.

This is a countrywide air-navigational system which will eventually supplant the present low-frequency A/N airways. In order to achieve the higher accuracy measurement of azimuth suitable for aircraft-guidance use in the terminal area, this single rotating limacon pattern used in the VOR has been extended. The objective of the development is to secure an improvement of at least one order of magnitude in accuracy and at the same time provide continuous information satisfactory for use both for visual presentation to the pilot and for use with automatic equipment such as the Air Force E-4 Gyropilot (A-12).

First of all, by going from VHF to microwave a two-fold improvement in operation can be achieved: (1) the mechanical spinning of the antenna reduces electrical phase errors which occur in the VHF technique; and (2) most of the radiation can be kept off the ground for the first mile or so, which means that an almost completely free space pattern is being radiated.

The accuracy of the azimuth measurement was also greatly improved by using a multilobe antenna pattern. Thus an antenna with a pattern having 11 lobes will produce 11 cycles of a sine wave at any point in space for one complete rotation. The phase shift for a given change in azimuth angle is now 11 times as great as for a single limacon pattern. Thus a 180° phase shift is produced in approximately 16° instead of in 180° of change in azimuth. The accuracy of the azimuth-angle measurement is therefore increased by a factor of 11.

It's not all clear gain, though, as there are 11 points of ambiguity in the measurement because the individual cycles are not separately recognizable without further refinements. To remove this ambiguity a final step is necessary. The 11-lobe pattern is superimposed on the single limacon pattern to produce a complex space modulation. By adding a second, higher frequency reference signal with which to compare the multi-lobe rotational signal, a "coarse" and "fine" combination is made available for a more exact unambiguous measurement of azimuth angle.

For example, if the antenna is rotated at 1650 rpm, the sine wave due to the rotating single limacon pattern (coarse azimuth signal) will have a frequency of 27.5 cps (cycles per second) at any point in space. The sine wave due to the rotating multi-lobe pattern (fine azimuth signal) will be 302.5 cps. The coarse and fine reference signals therefore have to be 27.5 cps and 302.5 cps respectively so that the rotational or azimuth signals may be compared with them in phase.

In the aircraft the four signals are separated in an indicator-receiver, the two rotational signals being fed directly to two phase detectors, and the two reference signals being fed through two phase *shifters* to the phase detectors. By gearing the shaft of the motorphase shifter to the indicator, the electrical phase measurement is converted to an azimuth angle measurement.

In normal operation, when the indicator is first turned on, the "coarse" signal controls the motor and positions the indicator approximately. As the motor drives the "coarse" phase shifter to give zero output from its phase detector, the "fine" signal becomes relatively larger, the relay switches over, and the motor is controlled by the "fine" signal. The indicator is thus actually positioned by the "fine" signal, the "coarse" signal being used only to prevent ambiguities.

In the early stages of development, the precision omni-directional radio range was tested in a converted bread truck at MacArthur Field, Sperry Gyroscope Company's research center on Long Island. As briefly outlined above, the microwave lighthouse transmits continuous wave radio signals. These are picked up by a receiver in the truck and are interpeted by electronic devices that plot an exact course on a map on a turntable (see photos). Guided by the signals, the operator running the test drove the truck up and down the various 150-foot wide runways, carefully surveyed and marked off in degrees. By comparing the position indicated on the map with the location of the truck on the runway, any error in the system could be determined directly.

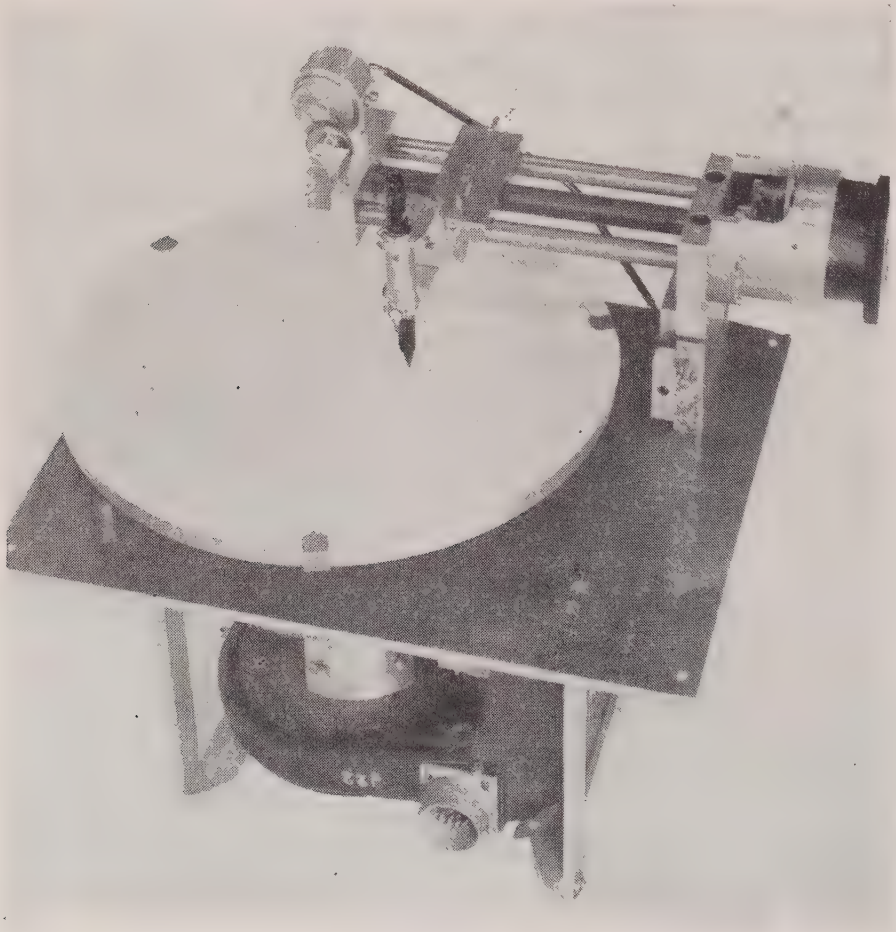
On a runway running radially from the omni-range station the truck was driven down one side, up the other side and down the middle. The map indicator traced three distinct lines, coinciding exactly with the runways on the map. It was found possible to trace two more lines on the same runway. This very precise test showed that it was possible to draw up to five lines within a 150-foot space more than one mile distant from the "microwave lighthouse."

Accumulated tests in the truck indicate an accuracy of plus-or-minus one-half a degree. Tests now under way at MacArthur Field in aircraft are expected to show even better results, ultimately to an accuracy of plus-or-minus one-tenth of one degree.

An example will show why such a degree

(*Continued on page 52*)

MAP INDICATOR was used by Sperry Gyroscope Co., in preliminary tests of its omni-directional range for airport traffic control. In response from signals from microwave tower, a truck was driven up and down runway. Pen on indicator plotted the truck's route



Never Get Lost

(*Continued from page 35*)

"Give us the test."

"What's the subject, today?"

"How many questions do we have to answer?"

The boys weren't interested in the survey test. They just wanted "out of class."

I answered all their questions at once. "Today the subject is Orientation Systems. I have only one question to ask you. All pilots answering correctly may be excused from the discussion which follows."

The multiple choice question I asked that day was:

Please check the correct answer or answers—Which of the following systems of orientation will work under any wind condition?

1. 90° system
2. Fade 90° system
3. True Fade System
4. Fade parallel or Perpendicular system
5. No system will work under all conditions.

Out of almost 500 papers handed in, I excused only seven pilots. Three of these later admitted they had guessed the correct answer. Number 5—"No orientation system will work under *all* wind conditions," was the right reply there—and I got a lot of argument from the remainder of the class.

"The True Fade system will always work," they said. But I had won my point. They were ready to listen to what I was about to say.

I write this article because many students are today taking G.I. courses for Instruments and Airline Transport ratings. Many schools teach the True Fade system of orientation, as an infallible method of finding the range station and airport. If you have been a student at a school expounding this theory, don't be too harsh on them. Maybe they didn't have to dig as I did, to find advanced subjects for a group of students with more flying time and experience than the instructors had themselves. I would like to pass along to you a brief description of the most popular orientation system. A good instrument pilot should know them all. Each has its advantages, but there isn't one of them that will work 100 per cent of the time.

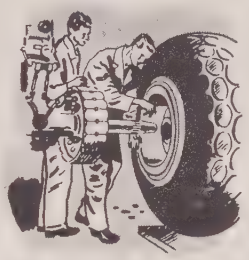
If all radio ranges were square and the wind never blew very hard, any orientation system would work all of the time. Range legs are often bent to follow an airway. This can make a squeezed quadrant (area between two legs) as narrow as 40° or less. An open quadrant may be 135° or more in width. (The range at Pittsburgh, for example.)

When a low overcast is present, wind direction and velocity are often unknown at altitudes above the bottom of a cloud layer. It doesn't take too high a wind velocity to create a sizeable drift angle. This is especially true in ships with a slow cruising speed (under 100 mph). A combination of drift, angle and very wide or narrow quadrant can foul up any orientation system. This is the reason a good instrument pilot must know the fallacies in each orientation method.

Having read thus far, some one is sure to come up with this: who cares? When does anybody have to work out an orienta-

(*Continued on page 50*)

"I Joined the Air Force to build a Career"



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TEST PILOT Lt. Packard gets last-minute instructions and a cockpit check before he takes off for flight in FJ-1. Instructor is Lt. Cmdr. "Bee" Weems, graduate of TPT School

Test Pilot Training

(*Continued from page 33*)

known *how* to fly a specific type—the fighter—he had only known half the story. Now he is learning *why* a fighter flies and, what's more, learning to fly every plane the Navy has, from heliocopters to multi-engine seaplanes.

He has learned that he was lucky to get in the school—a board screens all recommendations and selects one out of four nominees—nominees that are selected from many applicants.

He has learned that by the standards of the school his log book is skinny—most students have over 2500 hours.

He has learned that his experience is limited—many of the students are lieutenant commanders with, as the saying goes, more time over the high cone than Joe has in his sack. Lieutenant Commander Neff Bigelow, who rides in the same car pool, earned three Navy Crosses in the late misunderstanding in the Pacific, and Flight Lieutenant Johnny Ennis, RAF, flew *Hurricanes* in the Battle of Britain and attended the famous Empire Test Pilot School at Farnborrough, near London.

Joe has learned that his calculus is rusty and that there are a few things about analytical geometry he has forgotten. Most important, Joe has learned that the hot-rock test pilot is an anachronism; that the modern test pilot is primarily an engineer who happens to be an expert flyer.

On the first day of school, it was Captain Trapnell, the Navy's foremost test pilot, who talked to the class of 30 assorted Navy, Marine, Air Force, RAF, and civilian students.

"This is a tough course," he warned, "but we are interested in turning out men who can fly anything the Navy has or ever will have. We want men who can talk the language of the designer and the engineer.

"You will be responsible for decisions involving millions of dollars . . .

"You men already know how an airplane flies. The purpose of this school is to show you *why* it flies.

To achieve this goal, Joe found, the Navy had gathered a crack staff of civilians and naval pilots, all aeronautical engineers, some with masters and doctors degrees. It had assembled a stable of planes second to none, and provided an ominous ground course and flying schedule.

Joe was no dummy. He took one look at the ground syllabus and knew that the program would be no Sunday school picnic. The subjects were those of a post-graduate school in aeronautical engineering, and the classes extended through the day. For a short time Joe wondered when he was supposed to fly; quickly he found out. Flights were scheduled in the afternoons, between classes, at night and on week-ends. Joe took a long look backward at the lazy mornings around the coffee mess in the *USS Princeton* wardroom and the careless days in port at Coronado. Then he sighed and settled down to work.

By the end of the first week Joe and Neff and Johnny Ennis were each struggling home under a load of books, working until one o'clock in the morning, getting up at six for another crack at the math, and then reporting to class for a hectic day of formulas, laws, charts, and diagrams. The best years for test pilots are those between 25 and 40. Therefore, since the Navy test pilot must spend some of these years at sea like any other naval officer, the course is purposely compressed into six months so that the student will graduate quickly and get to work testing.

At first there was little flying, but later the flight schedule began to come out more frequently and Joe found that he was actually logging more flying time than he had on the career—more flying time and a different kind of flying.

Carrier flying is considered an exact science. Getting a jet safely onto the heaving flight deck of a CV calls for a certain delicate touch on the stick. And Joe had been considered a Landing Signal Officer's dream. But here at Patuxent River he discovered the real meaning of precision.

In carrier flying, a rendezvous at 5,000 feet means *about* 5,000 feet, or 5100 or 4900. No one in a carrier squadron has ever been grounded for breaking up at 150 knots instead of 145. But when you are flashing through the air in a new jet, recording instrument readings that will be distributed throughout the fleet in the form of fuel consumption charts; when you know that upon your information may depend the success of missions and the lives of former shipmates; then 20,000 feet means exactly 20,000 feet above sea level, no more, no less. And 300 knots means 300 nautical miles per hour, no more, no less. So you fly your jet, and you read outside temperatures during your climb, and you work out your average temperature, and you hit your computer and come out with the answers and then you shift to the gages and fly at precisely 20,000 feet and precisely 300 knots. And if the air is so bumpy you can't maintain exactly 20,000 feet and 300 knots, you land and wait for a smoother day. That is precision flying as taught at the Test Pilot Training School.

When Joe reported to the school, he had been more or less expert in one phase of flying: he was a jet pilot. His classmates had come from all over the fleet—they were seaplane men, or land-based patrol bomber pilots, or dive-bomber jockies. Since upon graduation they were to be assigned to the various test units around the Naval Air Test Center at Patuxent, and might be called upon to test anything from antique PBY's with new radar set-ups to supersonic fighters, they must be checked out in every type that the Navy possesses. For this purpose the school maintains a line-up of aircraft calculated to round out any pilot's log book—among them a big *Neptune* patrol bomber, a clumsy PBY *Catalina*, a slim *Tigercat* fighter, a stubby, competent F8F *Bearcat*, a *Corsair*, a sleek F9F *Panther*, a helicopter, a vicious twin-jet *Banshee* fighter.

So Joe, who had considered anything larger than a single-engine fighter strictly for the aged and infirm, chuckled as he watched his patrol-bomber classmates nervously strapping themselves into the tiny cockpits of jets, while he himself wrestled awkwardly with the yoke of the 90-knot *Catalina*. He saw Flight Lieutenant Ennis and another RAF pilot, Howard Murley, checking out in the latest ships that the U.S. Navy offered, and decided after watching Captain Gordon Payne, USAF, another classmate and a graduate aeronautical engineer,

(*Continued on page 52*)

Sky-High Sabre Dance

(*Continued from page 16*)

answer is still on the classified list. Let's just say that you get there damn fast!

Once you get up to altitude, you do whatever the engineers want and then come back down. While most of my work is done with my head down in the cockpit watching the various instruments, none of us are allowed to fly actual instruments with these ships. The Air Force pilots do, however. They have even made GCA approaches with them.

These new jets—the *Sabre* in particular—are so fast that we try to make our test runs in a circle or a cross-cross path over the same area. It isn't a question of changing winds or getting lost, but the different temperature and barometric pressure readings in widely separated air masses make the camera records difficult to interpret if you keep flying in a straight line. At 40,000 feet in an F-86, it's easy to cover just about all of Southern California on performance tests.

At these altitudes you rarely see anyone else. Most other test ships have chase planes to accompany them so that the other pilot can keep a look-out for other airplanes. However, on high-speed runs, nothing else will keep up with the F-86, so I usually check in by radio with the controller at the Edwards Air Force Base, Muroc Dry Lake, and let it go at that.

Suppose that the flight test happens to call for spins. Normally I'd do no more than two or three spins because the photo-recorder film would be used up and I'd be getting tired from the strain. You have to hold this ship into a spin and it will pop out as soon as you neutralize the rudders and ease the stick back to center. You can leave the power on if you wish—in fact we have to do just that for one of the Air Force acceptance tests. A four- or five-turn spin can drop you 15,000 feet, but when you start from 40,000, it doesn't seem so far.

Once you stop spinning, you close the throttle—if you had it open—and pop the dive brakes along the sides of the fuselage to keep you from accelerating too rapidly. It feels just like slamming on the brakes in your car at 40 mph, but the shoulder harness of the safety belt takes up all the shock and you never slam forward into the instrument panel.

When you're through with your test run, you head for the airport. I usually open the dive brakes and call in from 20,000 feet about two minutes out from the field. If the traffic isn't too heavy, I drop down to about a thousand feet, close the dive brakes and rocket across the airport at full throttle. I guess it makes the pilots of slower airplanes just a little envious.

I usually pull up in a regular tactical approach. That's a habit left over from flying fighters in the South Pacific. With the dive brakes open, you can hold down the pull-up to about 2,000 or 3,000 feet. You hit the gear-down level as the ship decelerates on its back at the top of your pull-up and drop full flaps at the same time so that you won't pick up speed again.

The *Sabre* is a heavy airplane—13,715 pounds full design gross—and it takes quite a large per cent of power to maintain altitude as you slow down. A jet engine is really efficient only at high altitudes and high speeds, and when you're slowed down for a landing or just after take-off, it takes plenty of power to stay in the air and battle the drag of the landing gear and flaps.

This ship has automatic leading edge slats that pop out at slow speeds to increase stability and aileron control.

I normally land out of a turn because the visibility is better out the side. Actually you can make a straight-in approach and see plenty well, but the nose comes up nearly 25° before the ship is completely stalled.

Aside from this tendency to touch-down nose-high, the *Sabre* lands quite normally. Once the gear touches down, I tap the brakes intermittently to slow down and then suck up the flaps as I taxi back to the line. The 6,000-foot runway here at the Los Angeles International Airport is easily large enough for the F-86.

Then you cut the switches, fill out a report of some

(*Continued on page 59*)

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TRAIN IN MIAMI--AIR CAPITAL OF THE WORLD

. . . Break a Record!

(*Continued from page 23*)

Now the question of balance together with the stress load reared its ugly head. I hadn't thought of that!! And how much gas would the engine use if it could get all this off the ground??? Anyway, with some patient work with pencil and paper I decided that the plane could lift the load (maybe) but that the center of gravity would balance well aft. What would happen in flight? CAA engineers informed me that, rigged thusly, the plane would have a tendency to fly with the tail ahead of nose!! Nobody wanted to test fly the thing loaded—even I didn't care too much for the job, but I did it. Then came the day for the record flight.

On the 2nd of September, at 1:03 P.M., PST, with the motor warmed I was at the end of runway 25L, Los Angeles International Airport, with the NAA timer, watch in hand, arm raised. Frankly, the hand that held the throttle was perspiring . . . no, "sweating" is a better word. The timer's arm dropped, and I shoved the throttle wide open and locked it there.

Two thousand feet down the runway stood Hank Coffin of Vail Field. If everything looked okay, he was to hold both hands aloft; if not, he was to wave me down. Vaguely I saw the blurred shapes by the side of the runway as I passed. The tail was up. My ship, the "Danny Hale," felt as if it were about to fly. I adjusted the stabilizer slightly. A quick glance at the tachometer and airspeed. Not enough revs, not enough airspeed, . . . then, suddenly, it was flying. We were 10 feet in the air. I nosed it down slightly to pick up more speed. The edge of the field passed under me. Now I was a hundred feet up. The tower called. Would I make a right or left-hand turn? A fog lay over the Pacific. The infamous Los Angeles smog filled the air. I didn't dare try instruments with this load —and this altitude—a spin would come too quickly. Must keep the ground under me. I called into the mike, "Making right turn to follow shore line."

We were at 300 feet now so I started a slow flat turn. I passed back over the north edge of the airport at 500, throttle still wide open, airspeed 90, climb indicating 200 feet. I was now on course for San Gorgonio pass. I wanted 2,000 feet under me as quickly as possible. If anything went wrong and I had to use the 'chute . . . Oh brother!

The heaviest load ever lifted by an Aeronca had been accomplished. Now the question was how high could I get it? I needed 8,000 feet at Prescott, Arizona, 9,000 at Albuquerque. At Riverside, California, 90 miles out, I was at 5,000 feet. At Lake Havasau I reported my position to Needles radio and was at 5,500. And that's all I could get! I had visions of circling in the valley north of Prescott burning out my heavy overload of gas until I could get the necessary altitude to climb the Rockies. But somehow, at sundown I found myself approaching Winslow, Arizona—the beam coming into my earphones sweetly. Things looked good. My flight calculator told me I was making good 140 mph groundspeed! Time to add a quart of oil to the engine. I reached for a can of it, put in the filler spout, put it in the special filler vent we had engineered, and suddenly the radio went dead!! For some reason Winslow had gone off the air! I checked—no—my radio was dead! I thought it over. I'd fly it without radio. Idly I looked over the instrument panel. The generator needle stood at zero. The generator was dead! Therefore the battery was drained. No lights. No radio.

"What the hell," I groaned to myself, "I'll fly her that way."

It got dark. I happened to glance out at the left wing tip. A faint glow. Another quick check of the instrument panel. The cuff of my jacket had tripped the landing light switch and was pulling all the juice out of both the generator and battery. I flipped it off. Half an hour later everything was rosy. Radio going, generator showing charge, my navigation lights burning brightly, the cheerful airway beacons winking enticingly way out in front. A bright moon waved me on. It was all beer and skittles now.

Albuquerque shimmered like a Christmas tree below me. The voice of the airway communications operator was cheerful as he gave me my special weather report and winds aloft. I was catching a 20-mile tailwind at 9,000. Amarillo was reporting overcast at 9,000 but better than 15 miles visibility. The automobile lights on the Albuquerque-Amarillo highway and the airway beacons all waving me on. This was easy. I tuned in a dance band. Some gal was singing "Home on the Range." Over Tucumcari, no need to bother with radio contact. Then, far off in the Northeast faint lightning flashes. No worry there, it was north of my course.

At Amarillo I was 40 miles south of my course. A violent thunderstorm was breaking right over the airport. I tried to make contact but static drowned out my reception. I flew on east. The storm was the granddaddy of them all! Finally, figuring I had reached the eastern edge of the storm, I turned north to resume my course. All of a sudden I was in it. I turned and ran out. I flew on east, tried again, and again, and again. With no radio contact I soon became lost. But after hours of flying I was finally able to make good a course northeast and at daylight was again able to use radio. I contacted Wichita! The cold, early morning hours found me north of St. Louis and my big tank dry. I tried taking off carburetor heat, which I had kept on all night, and my carburetor started icing up.

Well, I throttled back. I'd stretch it as far as possible. Springfield, Illinois passed under me. Chanute, West Lafayette, Fort Wayne. I knew I couldn't make it, but maybe Cleveland. I'd try. My last contact was with Toledo. Now I could see Lake Erie. My decision was to either fly it into Cleveland or fly it out of gas. I did fly it out of gas just 50 miles west of Cleveland and landed in a cornfield. I managed to get out of the plane and I ate a sandwich.

I had been in the air 21 hours.

Once on the ground, my first reaction was, "I'd had enough." The nervous strain of such a flight was too great. It wasn't worth it. Two days later I began to think. Before I started back to the coast I had made up my mind that with a bigger gas tank it would be easy! Besides, I had learned a lot of things about the ship and its performance that I had only guessed at before. I could do it! H—, I would do it!

MARINE CORPS emblem was put on the tail of Marsh's Aeronca *Sedan* by T/Sgt. James L. Cox of Marine Air Station at El Toro. Marines also gave Marsh long-handled underwear

On October 13th, I again went down the runway at Los Angeles. I had installed a larger tank and an electric pump. No more handwobbling all that gas up to the wing tanks.

Again I was over Lake Havasau, 240 miles out of Los Angeles. The electric pump was on, but the gas gages showed a gradual loss of fuel. The electric pump wouldn't keep up with the engine! I started handwobbling. I kept it up for an hour. Nothing happened. Here I was, surrounded by gallons of gasoline and running out of it!! Nothing I could do about it. But I was heavily overloaded. What would happen if I tried to land the ship? If a tank seam opened up, the cockpit would flood with gas . . . a spark and . . . ! I decided to try it at Phoenix. The ship went on perfectly. "The hell with this transcontinental lightplane non-stop flying!" said I.

So, back to the coast.

Two day later and I began to think for the third time, "It can be done, and I can do it." Now a new pump, new gas lines, new courage, new hope . . . and on October 14th I was again in the air. No winds to help me until I reached Oklahoma City. But from there on, Oh boy! The wind would come roaring out of the west 40, 50, 60 mph right on the tail—contact weather all the way!

The lights of Oklahoma City were cheerful, blinking in the frosty air. My outside temperature gage showed O Centigrade and the operator informed me that the winds were 50 mph, out of the Northwest, almost on the nose! I decided to leave the airway and proceed to Evansville on compass alone. I so informed him. The corrected course to Evansville is about 52°. I made a rough guess and corrected for drift by flying 30°. Imagine my surprise when at daylight I made radio contact and a soft female voice came in. It was Memphis radio answering. I began taking bearings with my loop. I was southwest of Memphis. I'd drifted sidewise about 500 miles during the night!

At Owensboro, Kentucky, I met a front and went on top. At 12,000 feet the temperature was –20° Centigrade. It was cold! The Columbus beam came in and I was on the east leg, holding to the twilight zone but with the nose of my plane set on north! The wind must be between 80 and 90 mph from the northwest. Columbus informed me it had a ceiling of 2500 feet. I'd still get that west wind. The Columbus beam faded. I tuned Pittsburgh, got a faint signal, it would come in stronger soon. I continued to fly. The cloud layer was endless. Plenty of gas left, I'd still make it, but not with the record I wanted to set. Suddenly a hole opened in the clouds, and I looked down 12,000 feet. *I was over water!* The waves told me it was lots of water. It must be Lake Erie. How the devil did I get here???

I turned and flew south for an hour, then set a course due east. Now gas became a real concern. I tried to establish radio contact—any station to orient on. Finally I tuned KDKA Pittsburgh. My loop showed it to be SW! I had caught a strong wind shift! The wind must be SW and strong. I was shivering, I was tired, I had been on instruments for five hours. I was getting nowhere. I began to pray for a hole in the clouds over land. I couldn't use my 'chute in this wind. I began studying my gas gages. Slowly but surely the wing tanks were emptying. Both my reserve tanks were dry. I continued to work my radio, but got no response. Then, a dark spot in the clouds . . . maybe I could see what was below.

It was a hole in the otherwise solid overcast. I still had gas, but was getting nowhere with it. I eased the throttle back and started spiraling down. At 2,000 feet the shoreline of Lake Erie came into view. I flew to the lake. In every direction was rain and low clouds. The ground was wet. It had been raining but a short time before. There was a railroad. I flew along it and, suddenly, there was an airport with long, surfaced runways. I came in for a landing. The boys from All American Airways and the communications personnel all gave me a hand out of the plane. I needed it for my legs were made of rubber. Suddenly I was very tired and very cold. They gave me coffee, and were otherwise very helpful.

Dunkirk, near Buffalo, is but 350 miles from my objective. But somehow getting there didn't seem to be so important. I was just plain tired! I had been in the air 26 hours and 10 minutes.

Anyway . . . I'd set my record. That is, it is a record as far as I am able to determine. I'm the only guy who ever flew sideways half way across the continent—from Oklahoma City to Dunkirk, N. Y. Those winds at 12,000 feet must have been *strong!*

San Francisco is really a nice place to fly to on weekends.

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Never Get Lost

(*Continued from page 45*)

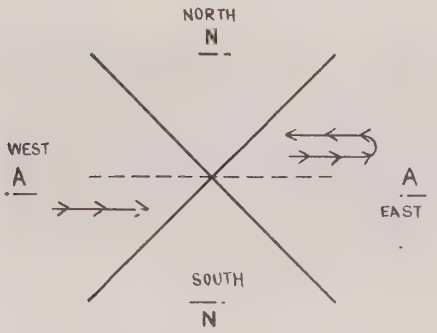
tion, anyhow? Who's gonna get lost?

The answer to that is simply this—if you ever want to hold an Instrument or Airline rating, you will have to know orientation systems. Even if you don't want the rating or already have one, your radio can be rendered inoperative temporarily and then you'll need to know them.

Static, or a blown fuse, will cut off radio signals. Suppose your radio goes dead under instrument conditions. You may be fortunate enough to receive signals again by replacing the fuse or flying into an area with less static (close to station). If this ever happens to you, familiarity with orientation systems will pay an extra dividend.

All orientation systems except the "90°" system identify the quadrant and then the leg. The True Fade, Fade 90°, and Fade Parallel or Perpendicular orientation methods all use the same method of quadrant identification. They differ only in leg identification.

With each of these systems, the radio is first tuned to the desired station. After the station is identified (each 30 seconds in code) the pilot must decide whether he is hearing the A (.—) or N (—.) quadrant signal. Once he has done this, it is a simple matter to determine in which A or N quadrant he is located.

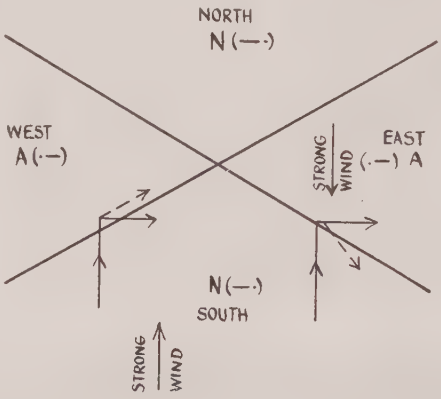


Sketch A: Orientation

In sketch A, the south pilot identifies the station and decides he is hearing the code letter A (.—). He turns the plane to an A bisector (dotted line) heading. (The average bisector divides a quadrant approximately in two.) The solid lines with arrows show direction of flight. The pilot cuts the receiver volume to a minimum. On an easterly bisector heading, the receiver volume will *increase* if the plane is in the western A quadrant, nearing the station. Remember, volume increases as the plane nears the station. If the plane is headed east in the eastern A quadrant, a *fade* in volume will result because he is flying away from the station. Knowing he is flying away from the station, the pilot will, therefore, make a 180° turn to the left and fly back toward the range and the station.

On an inbound heading in a known quadrant, intersection of only two legs is possible. For purposes of illustration, let us assume we are headed west in the eastern A quadrant. Knowing it is only possible to intercept the northeast or the southeast leg of the range station from this position, our next step is to fly until we intersect a leg. Fly through the leg until the first N (—.) or opposite quadrant signal is heard. This eliminates the possibility of bracketing and tying down a false or dog leg. We now have a choice of three methods of leg identification.

The first of these methods is the Fade 90°. It gets the first half of its name from the Fade system of quadrant identification. The 90° part of its nomenclature comes from the system of leg identification. After you have flown through a leg and received the first signal from the opposite quadrant, make a 90° turn to the right. Hold this heading one minute and you have identified the leg. Sketch B sets up a problem using the Fade 90° method of orientation and imposes a range pattern and wind condition which can foul up your problem. The solid lines show plane heading, the dotted lines show track.



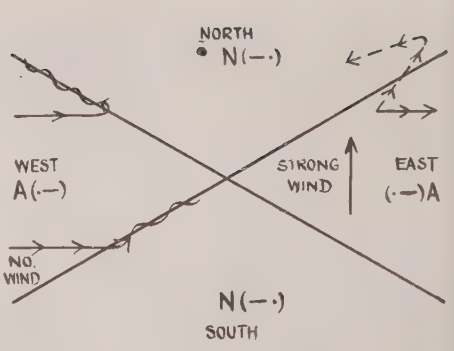
Sketch B: Fade 90°

It can readily be seen that with no wind a 90° turn (solid line) to the right held one minute will identify which leg has been intersected in this problem. The orientation starts in an N quadrant. After flying through the leg into the A quadrant, a 90° right turn held one minute will return the plane to the N quadrant *if* the southwest leg is intersected. If you hit the southeast leg, the turn will only carry you deeper into the A quadrant and away from the leg.

A strong north or south wind blowing, could cause enough drift in the problem to give a false indication. Because of the wide (number of degrees) N quadrant in this problem, the Fade 90° system is not infallible.

The heading, after the 90° turn has been made, closely coincides with leg heading. A wind strong enough to cause a 20° drift angle could cause your plane to track along the dotted lines and make you believe that you had intercepted the opposite leg. In a slow ship (under 110 mph), 20° drift angles are not uncommon. Never use the Fade 90° system in an open quadrant (over 90°) with an *unknown* wind condition.

If you find yourself in an open quadrant, use the True Fade system of orientation. This method works best in an open quadrant, but might go haywire in a squeezed quadrant (less than 90°). The True Fade system uses one fade for quadrant identification and a second fade to identify the intersected leg. Sketch C shows what could happen to a plane in a squeezed quadrant.

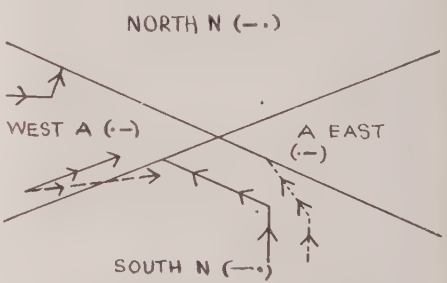


Sketch C: True Fade

In a squeezed quadrant, the bisector and leg heading may be only 20° or less apart. A strong south wind can drift your plane across the northeast leg in this problem. If you intersect a leg from an eastbound heading, in an A quadrant, you would naturally assume it was the northwest or southwest leg. In reality, it might be the northeast. The problem might become still further complicated if a left turn of 180° failed to bring you back to the leg. This can easily happen in the sketch shown, if you intersect the northeast leg with a strong south wind blowing. In a normal True Fade problem the fade or build received while tying down the leg will definitely identify your position.

This is illustrated by the problem shown in the western A quadrant with no wind blowing. Never use the True Fade system of orientation in a narrow quadrant with an unknown wind condition.

The Fade Parallel or Perpendicular works in either a wide or narrow quadrant, but if you start the problem in the bi-signal zone, close to a leg—beware! (If you are in a bi-signal zone with an unknown wind, use some other system of orientation. But if you are hearing only the harsh quadrant signal [no leg background], this system is fast and efficient.) After identifying your quadrant by the Fade system, look at your range pattern and decide whether the quadrant is wider or narrower than 90°.

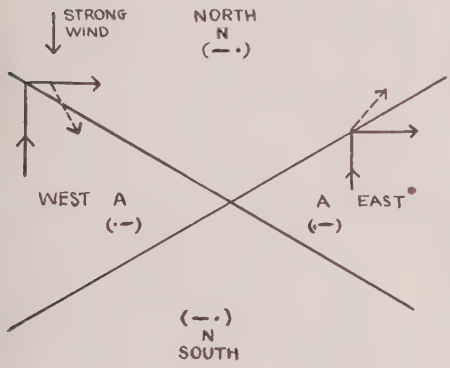


Sketch D: Fade Parallel

Drawing D shows four applications of the Fade Parallel system of orientation. Let's assume you wish to intersect the southwest leg. If you are in a wide (N) quadrant, turn parallel to the leg you do *not* want to intersect (the southeast). Turning perpendicular to the leg you want to intersect (the southwest) works fine in a narrow quadrant, but in a wide quadrant, you may intersect the very leg you are trying to avoid. (*Illustrated by dotted line.*) This is especially true if you start the problem a long way out from the station. In the A quadrant, which is narrower than 90°, turn perpendicular to the leg you wish to intersect.

If you want to hit the northwest leg, do not parallel the southwest. A strong north wind could drift you across the southwest leg and a lot of time would be wasted finding yourself again. Always stay away from the Fade Parallel or Perpendicular in a bi-signal zone. The system is fast and efficient in a square range with no wind blowing. You can intersect the leg you choose.

The 90° system is sometimes confused with the Fade 90° system of orientation. They use a similar method of leg identification. The 90° system does not identify the quadrant at all. If you find yourself in an A quadrant, turn to the N or opposite bisector heading. You know at once that it is then only possible to intercept two legs.



Sketch E: 90°

The 90° system works well on a square range or in a wide quadrant. Wind can cause false indication in a narrow quadrant. In Sketch E, the pilot turns to an N bisector heading, after identifying the A quadrant signal. From a north heading in either A quadrant, it is only possible to intercept the northwest or northeast leg. The 90° turn to the right and subsequent signal change, definitely establishes which leg has been intercepted. (If, when using the 90° orientation system, you find yourself flying away from the nearest leg, turn 180° to the left and return to the leg nearest you. This can be determined if you start in a bi-signal zone and fly into a harsh quadrant letter.)

It is quickly apparent that a strong north or south wind can drift the plane across the leg or hold it out in the quadrant after the 90° turn. This reverses the usual signal and renders the leg identification worthless.

I hope your radio never goes dead from a blown fuse or static condition. I hope omni-ranges eliminate the orientation portion of present instrument and Air Transport rating flight tests. But if you want to know how to use low frequency radios to locate yourself when lost, better learn each of these orientation systems. Then use these rules in picking the one best suited to the condition.

1. Fade Parallel or Perpendicular: Fastest of all. Never use in bi-signal zone.
2. 90° system: Fast because no quadrant identification. Avoid in narrow quadrants.
3. Fade 90°. Safe in a narrow quadrant. Avoid in wide quadrant.
4. True Fade: Slowest of all. Will work in highest percentage of cases. Avoid in narrow quadrant with an unknown wind.

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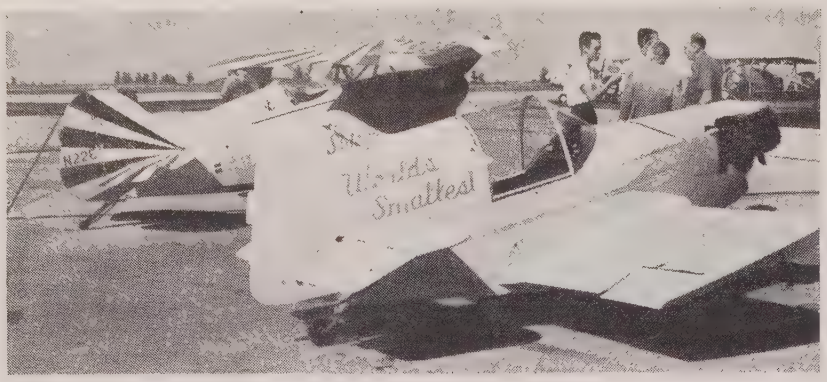
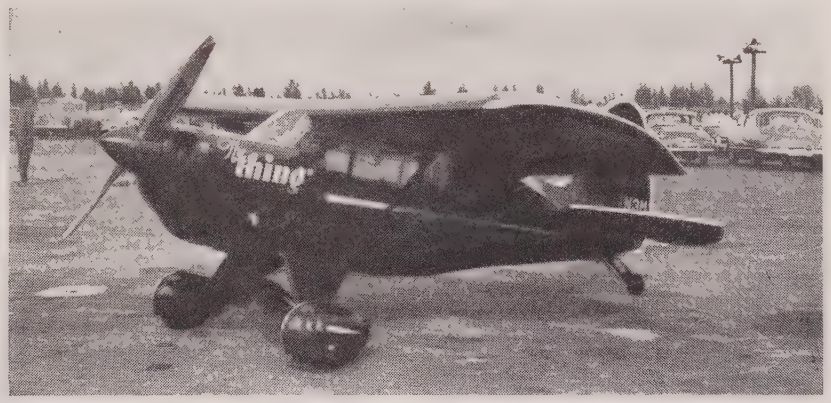


Backyard Airplanes

Here are two private planes that proved to be of great interest at this year's All American Air Maneuvers at Miami, Florida. The one pictured above is said to be the "world's smallest." Called the "Stits Junior," this ship weighs only 398 pounds, has wing span of 9 feet 5 inches, is 11 feet 4 inches long. Its ailerons are 17 inches wide, 11 inches deep. Powered by 75-hp Continental engine, it has 150 mph top speed at 2,450 rpm . . . but stalls out at 62 mph. Compare it for size with Betty Skelton's "Little Stinker," behind the "Stits Junior." The second interest-getter was the "Thing," as shown below. This one is homemade sport plane powered by 115-hp Lycoming engine, and made from standard *Cub* parts. A single-seater, it has a wing span of 12 feet 4 inches; is 14 feet long, and has a cruising speed of about 145 mph.



Test Pilot Training

(*Continued from page 46*)

that maybe Air Force men could fly too.

Joe discovered that more than precision, knowledge of aerodynamics, and versatility were required of the Navy test pilot that he must be skilled in testing techniques. He found that the power dives and 5-g pull-outs he had imagined to be the test pilot's lot were a small part of testing. He learned to do the sawtooth—climbing between two levels at a constant airspeed and power setting, recording the time, diving, and climbing again with a different air speed and the same power setting, in search of the best airspeed for maximum rate of climb—a handy figure for the Fleet fighter pilot in a hurry to intercept a high-flying bomber. He learned the difficult feat of recording stick forces while holding a plane in a turn at constant airspeed.

Along with the flying, and considered even more important at the school, was the constant grind of bookwork. At first there had been the usual wailing of the combat pilot confronted with the printed page—now the students were to busy to complain. Physics, aerodynamics, engines, stability, hydrodynamic, analytical geometry, propeller, instruments, calculus—no time for cocktail parties, no time for golf; more than enough work to make Jack a dull boy but not even time to get dull. A course that should have been spread over a year crammed into six short months. Joe sweated over his books and flew early Saturdays, when the air was smooth for testing, and wondered what had made him ever want to be a test pilot, and then went back to the midnight oil. . .

And then one early morning, hurtling through the blue Maryland sky at 30,000 feet, with a *Banshee's* powerful jets pulsing under him and no sound but the liquid rush of air past the cockpit, he had a flash of insight. For a moment the formulas made sense —for a moment Joe and the plane were a part of the universe, obeying the laws of physics and aerodynamics; the forces acting on the aircraft were suddenly tangible, and Joe had an inkling of the great *why* of flying. . .

Joe Doaks, Hot Pilot, was educated . . . and that education would help make fighting planes safe to fly to win.

Microwave Lighthouse

(*Continued from page 44*)

of precision is necessary. The illustration on page 31 shows a typical terminal area some years hence with the final approach path and the multiple tracks which feed traffic to it from surrounding en-route systems of guidance and control. It is assumed that the airport terminal area is circular, with a radius of 30 miles. Near its center is an airport with one active runway to which air traffic is fed. It is further assumed that the final approach speed along the approach path to the runway is 120 mph (ground speed), and that the maximum capacity of the system is 120 aircraft landings per hour. At the assumed approach speed and landing rate, aircraft are spaced at intervals of one mile or 30 seconds in flying time.

To meet these operational conditions both the ground controller and the pilot must know the instantaneous position of the aircraft within a 500 square foot area, or plus-or-minus 250 feet along the track of the aircraft and plus-or-minus 250 feet to the right and left of the track. If this positional accuracy is not obtained, the assumed landing rate will not be met. This assumed landing rate of two planes per minute may seem high, but this is the designed maximum capacity of the system and not the average arrival rate. Studies have shown that the actual arrival rate should never exceed 80 per cent of the maximum capacity of the system. This would mean 85 or 90 landings per hour per runway, rather than 120.

After Mr. Lyman presented a technical paper on this project at the annual meeting of the IAS, Dr. Edward P. Warner, President of the ICAO Council, gave it a boost in an enthusiastic five-minute speech. He stated that the operational ideas expressed in the paper represented the kind of thinking the aviation world should be doing in its attempt to resolve air-traffic difficulties. He said, "We are prone to take too low a sight for granted in our thinking about the accuracies required. This paper begins to approach the sort of standards we should be working for. The assumption that no shorter time separations than one minute are possible has handicapped progress."

That similar thinking is going forward in England is indicated in the discussion of Chief Research Officer D. Barnett of the RAF Transport Command at a Forum on Air Safety held by the Royal Aeronautical Society about a year ago. This followed a paper by Dr. G. E. Bell, head of the Operational Research Section, Ministry of Civil Aviation, on "Operational Research into Air Traffic Control" which assumes standards of accuracy in some ways even higher than those assumed in the Lyman-Litchford paper.

As some such system is put into effect during the next few years, all types of flying will be profoundly affected. Scheduled and non-scheduled passenger service, air-freight operations, executive and other types of business and private flying will fit into the overall pattern. Except for the smallest planes, the necessary airborne equipment should not prove to be too heavy or too expensive. Air travel is one form of transportation that is destined to expand, and a 98 per cent, or better, standard of time-table reliability will be an important factor in such growth.

. . . Cosmic Wind

(*Continued from page 19*)

To begin with, the *Cosmic Winds* are big enough for almost any pilot. I'm 5 feet 10½ inches tall and weigh 170 pounds; yet there's plenty of room in the 24 x 36-inch cockpit for me, a back-pack parachute and a heavy flight jacket. I don't have to remove my shoes as some of the pilots do in other small racers.

Regulations say that you must wear a chute because the *Cosmic Winds* were never ATC'd by the CAA. Personally, I believe that they could be licensed without too much extra work because they fly so beautifully and were stressed throughout by some of the best engineering brains in the country.

This SKYWAYS pilot report was made from the VanNuys Airport near Los Angeles in Tony LeVier's "Little Toni." The ship carries license N2OC and is identical to my "Minnow" except for cockpit instrumentation. The "Minnow" was in the East at the time of this flight.

There's no check-out. You just climb in and fly it. I did the first test flying on these little midgets back in 1947. Tony LeVier was in the hospital recuperating from a crack-up in an experimental military plane. The center of gravity (C.G.) figured out at 32 per cent aft of the mean aerodynamic chord, so we stretched the engine mounts 10 inches and put the C.G. at 25 per cent. That eliminated all the bad handling characteristics of the original airplane.

There isn't much pre-flight inspection to do on these ships. Just see that they have gas and oil in the tanks and make sure that there is enough air in the tires so that the wheel pants won't dig-in. There is only three-quarters of an inch clearance above the runway so we usually carry 40 pounds pressure in the tires.

The whole bubble canopy removes and you climb in over the trailing edge of the wing. There's a small reinforced step under the thin metal wing surface. If you're not too tall, you can get by with a seat-pack parachute, but I sit on the one-inch rubber pad that covers the plywood seat. The main wing beam comes right under your knees bringing your feet on the same level as your seat in level flight. It isn't very comfortable, but you must make some sacrifices for high speed.

The 15-gallon gas tank is located just aft of the firewall and above the rudder pedals. We eliminated all unnecessary gages and gadgets to cut down weight, so there is no gas gage. We usually measure the tank just before take-off and five gallons is enough for the average race. There's no reason to carry that extra 60 pounds in 10 gallons of fuel if you don't need it for competitive flying. On routine flights in the *Cosmic Wind*—or any other airplane for that matter—I take off with full tanks.

Once you get in the cockpit, buckle the straps and turn on the fuel valve under the tank. Then you're ready for a prop pull-through. There's no starter for the same reason that there's no gas gage, no radio, no tail wheel and no heater. All these items add weight and the ship will fly just as well without them—faster too!

In addition to the regular safety belt, the *Cosmic Winds* have an American-type shoulder harness. New fighter planes have Ejection seats for pilots. In the *Cosmic Winds*,

(*Continued on page 62*)

it's a pleasure...
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Jets on the Gages

(*Continued from page 24*)

ment flight. The admittedly short range of jet fighters has manifestly increased the difficulty of instrument flying; a real bugaboo coming home with near empty tanks.

Range is a matter of time. We have always increased it. And the second item, instrument flight, is well ironed out already by methods originally devised under a special research and training board of the 57th Group.

They have developed radically "old-fashioned" techniques to keep pace with the latest in modern design science. Today, the jets go out daily through 30,000 feet of solid overcast, but it has taken a lot of guts and determination to see the arctic all-weather jet-fighter problem through.

The prime result has apparently rendered purely rhetorical the question, "Can a jet out-zip a big bomber at *x*-thousands of feet and 'close in' with it while maneuvering in thin air?" If you can stalk the behemoth back out of defensive-gun range and lob rockets at its relatively motionless hulk, you don't have to out-zip it. Getting through the weather to find it was the toughy.

The brunt of the research fell upon the shoulders of a big, red-headed ex-RAF *Spitfire* ace, Major William Benedict, who has been flying fighters since 1939 when he first took a *Spitfire* into combat. At that time he was 19 years old.

While fighter pilots, by and large, are not the hottest instrument guys on earth, anyone flying in Alaska sharpens up in a hurry. He has to if he wants to keep alive. So at least they had an exceptional F-51 group when they switched to jets about 18 months ago.

Their first discovery was that when you go on instruments in the upper sub-sonic speed range, the F-80 is strictly from Wonderland where you have to fly a Red Queen's race.

The Red Queen had to run as fast as she could to stay in the same place, and in the high Mach numbers instrument flying catches up with 30 years ago.

According to air force analysts of the instrument-flying history, and speaking universally, it wasn't until just before World War II that we got away from the needle-ball and airspeed techniques. Now, the jets are back on the needle-ball, an instrument passed up some 300 mph back in time.

Major Benedict points out that at subsonic speed the gyro is no longer a reliable pitch instrument. And at high altitudes and high speeds, the airspeed indicator is relatively worthless for blind flying except in some degree as a power indicator.

Needle-ball and rate-of-climb have returned as the primary instruments for lateral and horizontal pitching moments.

Normally, when a gust load alters the flight attitude of an aircraft, the gyro remains "stationary" showing the level flight position, thus providing a reference to the straight-and-level position, and indicating the degree of correction necessary and the direction of misalignment.

All other blind-flight instruments are used as subsidiary references, but the gyro and the airspeed are usually accepted as primary instruments. They answer the busy airman's many questions the most quickly.

But at F-80 miles per hour, neither instrument is a truly reliable source of information. Benedict and his research board members have recorded persistent time lags in the gyro up to 30 seconds in duration at high Mach numbers and that is more than enough time to get a jet pilot in plenty of trouble on that shaky, high-altitude tight rope where the figher trips its light fandango between the stalling angle of attack and the hem line of the fighter red-line.

"It's an uncanny thing," Benedict declared. "You pitch forward and the rate-of-climb indicator will drop like an express elevator. The altimeter will unwind. The Mach dingus will start red-lining and you have the flare out for safety. But the artificial horizon will still be showing a normal flight attitude! Or, you can initiate a standard rate turn and get 90° around in a substantial bank and the gyro will still read straight-and-level.

"So, we have to rely on needle-ball for lateral pitch and the rate-of-climb for reference on the degree of climb or dive. Once the rate-of-climb drops, we then refer to the altimeter for a clue on how steep the descent is. If it starts to move fast, we correct quite a bit. If it moves slowly, then just a little back pressure is enough.

"Oddly enough, while the horizon lags, the slave gyro has remained a reliable direction-instrument and we have to depend on it considerably as the magnetic compass isn't worth a damn half the time up here."

Flying blind is only the small first step, though. "Our real troubles began," Benedict says, "when we contemplated the factors in letting down through 30,000 feet of solid overcast, into narrow, mountainous valleys, with relatively little fuel reserves. Here, a missed approach could easily mean a bail-out and a lost airplane. Fifty gallons isn't too much to just go around on, so what if you get home with 30?"

The answer is simple: you don't miss. Parachuting is a dangerous alternative even near a relatively populous area like Anchorage.

Hence, getting home when the ducks have quit flying is a tricky business for Alaskan jet pilots.

In the first place, they swear that despite important advances, fighter radio at its best compares only with transport radio at its worst, and when fighter radio is bad . . . . . ! Russian roulette is tame compared to hunting a fan marker in a jet low on fuel when northern lights or Aurora Borealis have clobbered up reception. You have to key your position from second to second on a let-down from, say, Skwentna, 70 miles north, to Elmendorf.

Here's how it works—you're in the soup at 30,000 feet and Elmendorf is reporting 800 feet indefinite ceiling. There will probably be some ice along the way. It probably won't be too severe, as heavy icing is less prevalent in Alaska than in the States, but you haven't got wing de-icers, either, so even a little is too much.

If you select to let down at 375 mph, the turbulence you can expect probably won't ram you clear through the canopy.

Now, maybe it's rough over Skwentna, and you're tired. You read the clock and call it 49 minutes when it is actually 48. Say you are due over Elmendorf in 10 minutes and 30 seconds, considering the estimated wind

(*Continued on page 56*)

AIRMEN of 66th Fighter Squadron gather 'round an F180 for cockpit check prior to "mission"

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4-50

Jets on the Gages

(*Continued from page 54*)

factor. You figure, then, on hitting the range at 59:30, but actually you'll be there at 58:30. That's a big minute, as you'll see.

You hit the cone on time with the radio squalling like a buzz saw chewing a railroad spike.

You start counting seconds as you come up to 59:30, and when you don't find a clue by the time 59:45 has ticked off you know that home sweet home is 'way back yonder. Up ahead is the Chugach Mountain Range.

A high rolling jet will get you there from Elmendorf with practically no delay and at 75 seconds past the range station the margin is pretty slim. If you have, meanwhile, picked up a load of ice and gotten down to 70 gallons of fuel, Lloyd's of London wouldn't care much for your business. Uncle Sam won't make a dime on the money he spent for your education.

Therefore, you don't make mistakes involving a whole minute in the first place. You don't even make mistakes involving 10 seconds. The 57th hasn't lost one that way yet.

Of course, simplification techniques are constantly being developed and an aircraft control and radar approach system is now being used where available to monitor a jet's progress down to where GCA can take over. And, while we're in that neighborhood—every pilot in Alaska said that the whole show is completely dependent upon those veritable Wizards of Oz in the GCA shacks and the AACS personnel associated with them.

Certain other procedures that are restricted have helped perfect jet operations until the term "all-weather flying" has a genuine meaning when applied to the new Lockheed F-90 currently under-going tests.

The techniques are being incorporated into Stateside training programs with excellent results and 57th has several recent flying school graduates with less than a thousand hours doing a good job in the Alaskan theater.

The pilots are as sure of themselves today as they were in combat as 'teen-aged second lieutenants, and they hardly average 27 years, with flight commanders in their 30's. They have seen warfare alter theories before and they don't show alarm when spooked by the B-36's ponderous shadow.

My guess is they consider the Boeing B-47 as a perhaps unrecognized "fighter-interceptor" of some future date, perhaps more deadly in that role than any other. Its got range galore and the payload of a freight car full of rockets tipped with proximity fuses and the killing power of an eight-inch gun.

Keeping that in mind, and admitting certain limitations in today's fighter planes, practically all fighter pilots still think they'd buy the man in a *Cutlass* (Chance Vought F7U) or a *Sabre* (North American F-86), if the Defense Dept. ever got around to staging that fantastic proposal to match Air Force and Navy jets against the intercontinental bomber. Provided, of course, the jet interceptors aren't forced to close in and squirt the big tub down with a water pistol.

Instrument techniques developed by the 57th on tactical assignments in the northland have materially altered the life expectancy of the fighter unit. It will be many years before you find them parked beside the horse archer in the Smithsonian Institution.

Hell-Bent for Rescue

(*Continued from page 21*)

aid in the attempted interception.

The weather was bad. The weather was worse than bad for a rescue mission, so each SB-17's radar operator kept his set in operation. If the lost plane could not be sighted by eye, there was a chance he could be picked up on the scope.

Repeatedly, the two search planes tried to make VHF contact with the B-29, but this failed. Meanwhile, Kindley Field had made arrangements for other planes to join in the search. After the distressed aircraft, enroute from March Field, California, radioed it was ditching, even more planes were called in—PBM's, B-29's, C-47's, B-17's, PBY's, C-54's and SA-10's, to aid in one of the biggest peacetime searches in all history.

Each ship was to fly a six-hour search. In this way they could get back to base, land and then be ready again for an all-out search at dawn the next day. Plane crews were briefed on the creeping-line type of search. If they sighted anything on the sea's surface, they were to use the expanding square-type search.

When one of this armada of over a 100 aircraft sighted an object floating upon the heavy seas, an SB-17 search plane carrying a droppable lifeboat was diverted to investigate.

Four suspension cables fasten the big boat to the underside of the SB-17's fuselage. These cables run up to standard bomb shackles. Developed at Wright Field, and patterned after a droppable boat first designed by the British, the A-1 lifeboat weighs 3,500 pounds. It has 32 water-tight compartments, carries two engines, dry clothes, sails, food, navigation charts, first aid kits, prayer books, and enough gas to propel it 600 miles. Three 48-foot cargo chutes float the boat nose down to the water at a 50° angle.

Another day dawned over the desolate Atlantic with still no clue as to the exact whereabouts of the ditched B-29's crew. Time became more and more of a factor as the hours sped by. All available aircraft were ordered up in an all-out search.

Flight "D's"" specially refitted SB-17's with their modern radio, radar, Loran, and VHF homing adapters, gassed up and thundered out again and again. Hunched before large windows that formally housed the ship's waist guns, the SB-17's scanners searched the mist-shrouded wastes below.

When you realize that under normal conditions a man floating on the sea in a Mae West can be spotted only at three-quarters of a mile distance, you know what a job these scanners were up against. Conditions were far from normal. High winds whipped the seas into troughs where bobbing objects were hidden from view, and low ceilings shut out vast sections of search area.

Finally, on the 19th of November, over 60 hours after the search was begun, a B-29 sighted floating debris—yellow boxes, a bomb bay rack, and other tell-tale objects. This was relayed to the search base and an SB-17 with Lt. Edw. Lynch at the controls, roared out for a thorough search. Once in the area, Lynch began a ladder search.

At 8:30 left scanner, Sgt. Ralph E. Hawes's eyes popped wide. Sighting through the haze, he called off,

"Two liferafts at 9 o'clock, one-half mile."

Lynch turned the SB-17 and circled the rafts. Radar operator Cpl. Darb dropped a sea marker and smoke bombs . . . A pattern was thus set up to drop the lifeboat.

Fifteen minutes after first sighting the rafts the A-1 lifeboat was dropped. The three chutes blossomed perfectly. Although 50 to 60-foot waves made it difficult to spot the sea marker and the haze all but blocked out the bomb smoke, the boat landed less than a 100 feet from the rafts!

The survivors in one raft paddled to the

DITCHING DRILL is important phase of training. Here men of 373rd Reconnaissance Squadron, VLR Weather Crew, get away from a "ditched" B-29 just offshore at Kindley AFB

big lifeboat, started the craft's engines and picked up their buddies in the remaining raft. The SB-17 radioed the news to Kindley Field and other searching surface vessels continued to circle the rescued airmen in the lifeboat.

Soon crewmen of the search plane sighted a destroyer. They watched the destroyer take the salt-caked survivors aboard, 385 miles northeast of Bermuda and 79 hours after plunging into the ocean. Then the "Dumbo" turned and headed back to Kindley Field, another search mission successfully accomplished, the plane's crew in a joyous but quietly thankful mood.

Rescue such as this is all in a 24-hour day's work for Capt. George C. Welch and the other men of Flight "D". The Flight is on 24-hour alert, seven days a week, to search the skies and sea for lost airmen, intercept planes in trouble, check on unfamiliar objects sighted at sea, hunt lost fishermen, and aid or evacuate people in critical condition aboard vessels at sea and who require immediate hospitalization to live.

Flight "D's" commanding officer, Capt. George C. Welch, says, "Due to the nature of our operations, it would be impossible to even approximate the number of lives saved by this organization. We consider the escorting of lost aircraft into Kindley, the spotting of lost survivors as having possibly contributed to the saving of the lives of the entire crew."

Flight "D" chaperones some 2,290,896 square miles of empty ocean—from Bermuda half-way to the Azores, half-way to Harmon Field, Newfoundland, half-way to Puerto Rico, and to within view of U. S. coastline.

"The majority of calls," states Capt. Welch, "concern aircraft inbound to Bermuda with engine trouble or navigational difficulties. Flight 'D' sits tight at Kindley until a call comes in, then look out! We're off and running!"

The Flight consists of three complete crews, pilot, co-pilot, navigator, radio operator, engineer, and radar operator, plus sufficient maintenance men to keep the two SB-17's and their specialized equipment in tip-top shape. At present the Flight has 11 officers and 33 airmen.

Everytime a "Dumbo" takes off on a search mission a rated navigator must be aboard. This way the pilot is not troubled with navigation problems.

Quite recently, the Flight was alerted to save a patient suffering from a ruptured appendix at sea. Aboard the *SS Langleescot*, the vessel's surgeon lacked the necessary equipment to perform the operation. A list of equipment needed was radioed the Flight. The base hospital packed a complete surgical kit in a droppable container.

Forty-five minutes after the first message was received an SB-17 lifted off Kindley Field. Three hours and 30 minutes later the plane thundered over the *SS Langleescot*. The plane made a run over the surface vessel to determine wind direction. At the same time, pilot Lt. Bill Griner, chose a likely spot to drop the kit. On its second run the "Dumbo" dropped the kit on the *Langleescot's* forward deck. The appendix operation was successful. The ship's master wrote a letter commending the Flight.

Another time, also recently, a B-29 weather ship scouting a storm over the Atlantic, 1100 miles out from Kindley Field, radioed that one engine was dead. After determining the relative position of the aircraft, true course, and ground speed, the Flight's search ship roared off. Usually only one crew goes out on an interception of this sort.

The Flight pilot finally made voice contact with the ship.

"When voice contact was established between the distressed aircraft and ours," says Welch, telling of the incident, "we directed the weather ship to send out homing signals. Our SB-17 then 'homed' on the B-29, correcting its heading as indicated by the homing adapter. We intercepted the weather ship 408 miles out from Kindley." When visual contact was made, we flew formation with the B-29 just in case further difficulty developed. Fortunately, the ship got back OK.

While still escorting the crippled weather ship, the search plane was alerted for another similar mission. The "Dumbo" crew landed, refueled, and were airborne on the second mission, all within 45 minutes! Early one March morning, a Mr. Tavaris went fishing off Bermuda in an 18-foot boat. A day later he still had not returned. Both SB-17's and a borrowed C-47 bellowed out to the various fishing spots around the islands. The search had just begun when the Hamilton (Bermuda) police department called to say that Mr. Tavaris's boat had been found on a small island in Hamilton Bay. The searching craft were called back and the alert canceled. The fisherman, having lost the engine to his boat, had spent the night on a tiny island.

Some months ago a Cuban airliner contacted the Flight. The Latin pilot was in a stew. Over the radio he shouted.

"Oil pressure, she go down. Engine temperature, she go up. We feather." The Flight scooted out and flew formation with the Cuban back to Bermuda.

The Cubans were so delirious over the escorting that it wouldn't be surprising if they dreamed up a rumba Flight "D"—so they, like airmen, could go on and on singing their praises.

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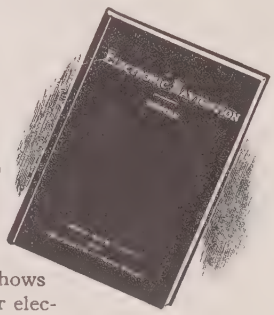

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Dilbert

(*Continued from page 37*)

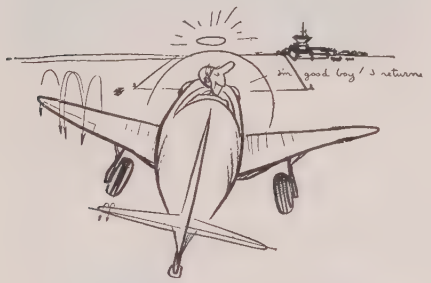
as he remembered how, when he removed one of the wing inspection plates at that time, a little mouse had jumped out.

The investigators smiled too, knowingly, as they visualized the mouse gnawing off the lacing cord to make a nest. According to them, Dilbert should have uncovered a portion of the wing right then and there, to check for possible damage. Maybe they also should have advised him to keep a group of traps set inside his wing and tail surfaces to apprehend future saboteurs.

Glide Speed—Shortly after take-off, Dilbert noticed that his fuel gage was out of commission. Since he was going on X-C, he decided to return and have it fixed. This was a wise decision, but poorly executed; he lost control and spun in on his landing approach.

Dilbert stoutly maintained he had hit an air pocket. "It must have been. I was in a normal glide, when suddenly everything went mushy and she fell out from under me."

The only air pocket involved in this accident was the one between Dilbert's ears. He said, himself, he was in a *normal* glide. But the conditions were *abnormal*: his plane was fully loaded. Although he had never made a full-load landing before, even Dilbert should have known that load increases stalling speed.



"Only air pocket is between Dilbert's ears!"

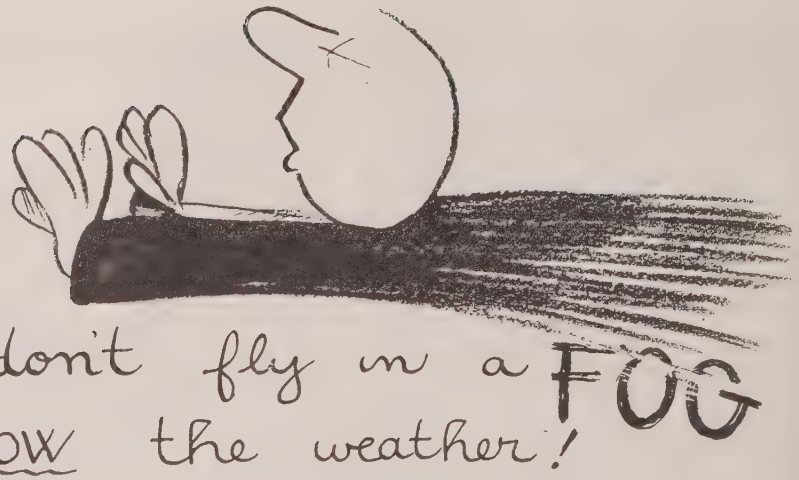
The fact that your nose is below the horizon is no insurance that you have sufficient flying speed. With a heavy load, it is necessary either to increase rpm or angle of glide. The exact amount requires an intimate knowledge of the flight characteristics of each airplane you fly. If you don't know, play it smart; use a little excess speed.

It was from dumb accidents like this one that an old aviation paradox was evolved.

Recognize a flight hazard, it isn't there; fail to recognize it, there it is!

Be Weather Conscious—Now that winter's back is broken, don't get careless about the weather. Experienced pilots look upon this period with misgiving and concern. They know it marks the season of rapidly changing flying conditions, when extremes are most likely to be encountered.

Whether you fly commercially or for pleasure, remember there is an extensive organization designed specifically for your use—to protect you against these weather hazards. And this protection is yours for free! All it requires is enough interest and initiative on your part to ask for it, plus a normal amount of flying intelligence to use it effectively.



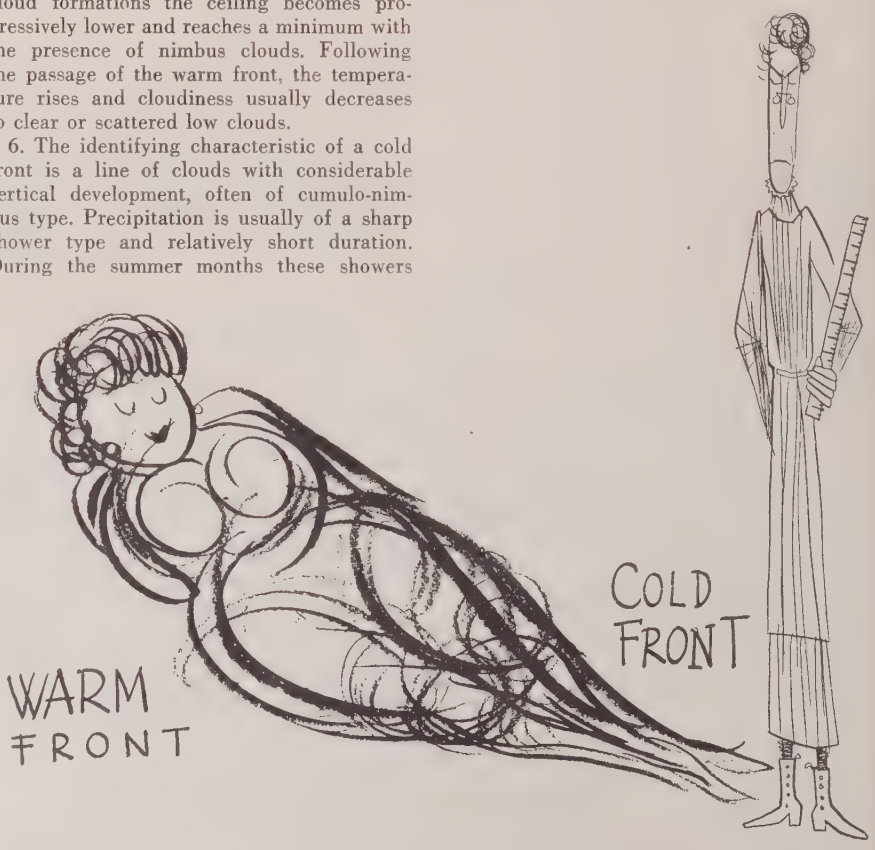
Surely you know how to interpret a weather report. If not, make this a *must* before you start out on your next X-C. There isn't space here for more than a few highlights.

1. In the temperate zone (includes U.S.) weather generally moves from West to East.
2. Allow considerable leeway for the direction and speed of a storm in relation to your flight path.
3. To plan your flight effectively, accurate knowledge of the weather trends at your destination is necessary, and must be projected to your ETA.
4. The heating and cooling of air due to the time of day involved, or as it crosses water or land masses, create local disturbances, sometimes of serious consequence.
5. The identifying characteristic of a warm front is a cloud sequence ranging from the high cirrus, which usually precedes a storm by several hours, through the alto-stratus and strato-nimbus in which rain, snow or sleet is present. Through this sequence of cloud formations the ceiling becomes progressively lower and reaches a minimum with the presence of nimbus clouds. Following the passage of the warm front, the temperature rises and cloudiness usually decreases to clear or scattered low clouds.
6. The identifying characteristic of a cold front is a line of clouds with considerable vertical development, often of cumulo-nimbus type. Precipitation is usually of a sharp shower type and relatively short duration. During the summer months these showers will usually be accompanied by thunder and lightning, and possibly hail. The air is very turbulent in the squall clouds of the cold front. With the passing of the cold front, a definite change of wind in a clockwise direction usually occurs, followed by clearing showers, good visibility, and lowered temperature.

Occasionally you hear the complaint that weather reports are too vague. I'd like to put in a word here in defense of the meteorologist. Next time you are planning a X-C and have access to a Weather Bureau office, make a call on that much-maligned gentleman. Lay your problem on the line; you'll be surprised how much help you will get.

Safety Quiz Answers (page 37)

1. Plane that has the other on its left has the right of way.
2. Clear runway immediately and wait for further instructions.
3. Bail out.



Sky-High Sabre Dance

(*Continued from page 47*)

length and you're through with that flight!

This *Sabre* is so easy to fly that we checked out all our factory pilots without any dual jet time. Our only caution was not to try to fly too fast too low for the first 10 hours because it takes all-outdoors to make a turn at high speeds.

The *Sabre* is a wonderful acrobatic airplane. With its symetrical wing, it flies as well upside down as it does right-side up. In rough air, the wings flex just a little and you don't get bounced around as much as you do in some airplanes. Still, we wear those big padded Lombard helmets just in case, because the air gets quite solid at the speeds the *Sabre* will fly.

I was assigned to this test-flying business in the first place because I'd had considerable Air Force experience in fighter aircraft. In fact, I was fortunate enough to be just coming in from a party at Honolulu on the morning of December 7th, 1941. Another officer and I had our two P-40's parked on a small grassy fighter auxiliary strip at Haliewa. We were the only two fighters to get into the air during the bombing and I was lucky enough to get four *Zero's*. After that I went down that long line of dismal little islands in the South Pacific with the 8th Fighter Group. I wound up with a total of 18 Japanese planes before North American asked the Air Force for a pilot with both an engineering education and combat experience. I have an engineering degree from Purdue University, so I was fairly well equipped for this test-flying business.

My first job was project pilot for the F-51. That ship was plenty fast and plenty sharp, but propeller jobs are old fashioned these days for fighter planes. Up at Muroc they call the experimental pilots the "Buck Rogers Boys," and some of the yet-secret aircraft up there really look as though they came straight from the Sunday supplements.

I made the first flights in the original XF-86 after following the project through the design stages. The first runs, of course, were taxi tests on the broad dry lake at Muroc. Then we made glorified taxi tests where we pulled the nose off the ground, eased a little way into the air, and then dropped back to the dry lake.

The first full flight took nearly an hour. I took off, climbed to 10,000 feet and checked the slow-flight characteristics of the plane. The engineers did a superb job on this ship. Even on the first flight, she handled like a dream. With the extensive wind tunnel data on hand, I knew how she would fly even before we got her into the air.

When I hit the gear-down lever on the first flight, the nose wheel stayed up. Any experimental airplane is bound to have little irregularities like this, but after a half-hour of sweating and swearing, I pumped down the gear strut and came in for an uneventful landing.

This *Sabre* is the best fighting machine I've ever seen. It's really fast. There again I can't say just how fast, but it holds the official world's record of 670.981 mph. Major Richard L. Johnson of the Air Material Command made four passes averaging that speed over the three-kilometer course at Muroc a year and a half ago. The same pilot turned in an unofficial 669.75 mph at the 1948 Cleveland Air Races in poor weather conditions. On both these flights, the *Sabre* carried a full combat load of guns and ammunition.

The fastest time that the Air Force has yet released for the *Sabre* was flown by Major Frank Everest on a hop from Dayton, Ohio, to Washington, D. C., in 33 minutes, 3 seconds. That figures out at 710 mph.

We've even had the *Sabre* mistaken for a flying saucer. CAA officials in San Diego County believe that residents who saw a "mysterious high-flying object identified as a comet or foreign plane which trailed a mile-long luminous wake" were really watching an F-86 on a routine flight.

One witness said the object appeared to emit a brilliant green light. Another said it was a "tear-drop shaped object from which light rays eminated." A private pilot watching through field glasses agreed that it was an airplane leaving contrails of vapor, "but I can understand that people watching without glasses thought its trail looked like a comet's—especially when the sun reflected on it," he said.

The speed potential of the *Sabre* is due to many factors. Probably the most important is the 35° sweepback of the wings. A sweptback wing is an old theory but the F-86 is the first American fighter in which sweepback has been used to delay the formation of compression shock waves. The boys in the "Slide Rule Department" explain that the sweptback wings and tail more or less "fit into" the shock-wave pattern. The actual wing section is very thin and uses a sandwich-type construction that was a Grade A headache to design.

This test flying is a fascinating job. It's a constant challenge to a pilot's ability and still a lot of fun. I wouldn't want to sit cooped up behind a desk. When a new airplane comes along and you're assigned as project pilot, that ship is your baby. You live, eat and almost sleep with it from the time it comes off the drawing boards until the bugs are all worked out and the ship is rolling off the assembly lines.

Not all my flying, however, is approaching the speed of sound. We have five *Navions* here at North American that we use to shuttle pilots and technicians on the 45-minute hop from the factory to Muroc. When I go up over the Sierra Madre Mountains to the dry lake in the *Navion*, guess who flies?

That's right. I get behind the wheel whenever I have the chance.

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. . . Cosmic Wind

(*Continued from page 53*)

we have a sure-fire canopy-remover. A small CO-2 bottle, similar to those used in soda water chargers or Mae West life jackets, is mounted behind each of the safety pins that secure the canopy. Just pull the lever under the throttle and —pfffft—you're in an open cockpit.

Instruments include a compass for cross-country flights, an altimeter, oil and fuel pressure gages and toggle switches for the two magnetos. During the 1948 Goodyear race which I won, I flew two laps with one magneto turned off. My mechanic had put 12 strips of tape—one for each lap of the race—across the bottom of the instrument panel. When I pulled off number 10, I accidentally cut one toggle switch, but the little engine didn't drop rpm's noticeably.

The ship has an impulse on the magnetos and I start with both toggle switches on. It is rather difficult to prop because the center of the spinner is so low. Remember how the older model *Ercoupes* were hard to hand-crank? The *Cosmic Wind* is worse.

Before each flight, I call the control tower by telephone and tell them when I plan to fly. The "men behind the glass" here at the VanNuys Airport are very cooperative, and they'll give me a green light when I'm clear to go.

I usually taxi out at 1,000 rpm and steer with the heel brakes. We had to use heel brakes rather than the conventional toe pedals, because the rudder pedals almost touch the fire wall and the bottom of the gas tank when they are fully extended. There just wasn't room for toe brakes, but none of the pilots who have flown these ships have had any trouble with them. Even with the old-fashioned tailskid, the *Cosmic Winds* steer very easily on the ground.

Visibility, even on the ground, is excellent because everything else around the airport is so big that you can't help but see obstructions.

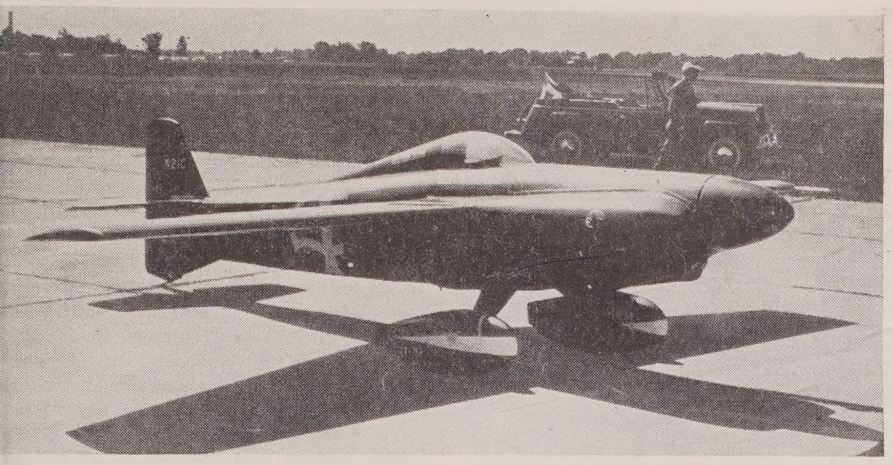
The spring duraluminum (80ST) landing gear is rather stiff, but not at all uncomfortable.

At the end of the runway, you check the mags quickly at 2,000 rpm and run up to full throttle for a power check. The 85-hp Continental is cowled in rather tightly and it will heat up during long runs on the ground.

When the throttle goes all the way forward on that power check, the stick must be all the way back and the brakes on hard. The slightest gust of wind will make the ship nose-up. Actually, the tail skid of my "Minnow" comes off the ground about two inches during these power checks even though the stick is clear back in my belt. Because of the extended nose, all the *Cosmic Winds* are a little nose heavy on the ground.

Take off in these midgets is always a thrill. Just as a matter of habit, I usually taxi out on the runway after I get the green light, set the brakes and open the throttle all the way. That's about 2700 rpm on the ground. Then I climb off the brakes and hold on to my hat. The torque takes nearly full right rudder at the start of the roll, but that decreases as I pick up speed.

I let the tail come up slightly and then ease back on the stick. By that time I'm in the air. In no-wind conditions, these midgets will be flying in 300 feet.



MINNOW, the author's *Cosmic Wind,* had a new fuselage for the 1949 National Air Races

By the time you're over the end of the 5,000-foot runway at VanNuys, you'll have 1500 feet if you want to pull it up. Best angle of climb with full power is about 70 mph.

With its little, short exhaust stacks and high rpm, the ship has a ratty kind of a roar. There is surprisingly little vibration.

When you "feel out" any airplane, no matter whether it is a 565-pound midget or the 185,000 pound Lockheed *Constitution* that I helped test, you take it up to a safe altitude and see how it flies at slow speeds. This midget stalls power-off at 63 or 64 mph. The nose comes up to about landing altitude and the stall breaks fairly rapidly. There isn't the burble in the elevators that causes the stick buffeting that you find in most commercial airplanes. After all, there isn't much wing out there to cause buffeting. You have full aileron control right down to the stall and the ship will fall through straight ahead with no tendency to duck a wing.

One of the surprising things about these little *Cosmic Winds* is the rapidity with which they'll come back flying after a stall. The instant you ease off that back-stick pressure or add a bit of throttle, you're right back flying again.

You can stall this airplane power-on at full throttle if you like. The nose comes up quite high and the ship will hold on to about 58 mph, but it takes about one-third rudder to handle the torque.

One of the things that we spent a lot of time and study on before building these ships—and then spent more time test flying to prove our calculations—was the subject of high-speed stalls. In an accelerated stall (that's the type of stall that occurs when you tighten up a turn or try to pull out of a dive too quickly) there is considerable buffeting. The nose tends to drop and then kick right up again as speed increases.

The ship is stressed all the way through for 7½ g's. I have pulled 6 g's in turns and in gusts in races, but never has an accelerated stall crept up on me.

There's no need of a pressure "g" suit in these little ships. While 4 g's over a long period of time will make a pilot black out, he can stand as high as 9 g's over a very short space of time without blacking out. In racing, the high loads in turns last only a couple of seconds at a time.

When you get into acrobatics, the rate of roll of the *Cosmic Wind* is out of this world. It will do a slow roll in three seconds. The midget and the F-80 roll almost the same. Both ships roll with almost no rudder or forward stick while inverted. You just ease in full aileron, hang on and count the horizon as it goes by.

This ship flies very well up-side-down except for one minor technicality. The engine quits as soon as you go over on your back. If you don't keep rolling right on over in your slow roll, the power-plant will cough and spit for up to 20 seconds before the fuel pump will fill up again. The hotter the day, the longer it takes that pump to pick up.

I've never snap rolled this ship. A snap roll is just a spin going forward and it imposes some mighty rough air loads on the plane.

It spins well. You must use full back stick and full rudder to keep the ship in a spin. Just as soon as you think about coming off the controls, you're out of your spin. The recoveries are so good that I'm convinced the ship would pass CAA certification tests without any changes.

This airplane is built for fun. Whenever I can find an Air Force C-47 plowing along over Los Angeles, I like to sneak up alongside—at a legal 500 feet—and just sit there until one of the pilots notices me. It's interesting to watch the expressions on their faces as they do a "double take" when they see this little airplane sitting up there off their wingtip. Then I pour on the throttle and leave them.

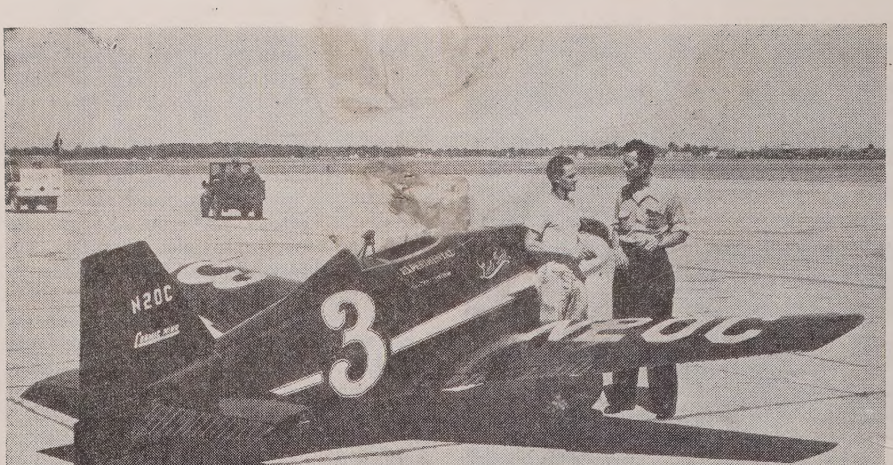
Over the foothills near Pasadena one day, I came up beside an Air Force T-6 at 4,000 feet. When the pilot noticed me, I pulled in fairly close and motioned him to open the throttle on his 600-hp engine. When I saw him start to accelerate, I poured on the "coal" and left him behind. It took him the 30 miles to the VanNuys Airport to catch up with me.

When it comes to running away from these bigger, more powerful airplanes, you have to do it at low altitude because there's no blower or supercharger on the midget.

I'd like to say a good word for the little Continental engines in these ships. They're

(*Continued on page 64*)

LEVIER and Associates built *Cosmic Winds:* "Little Toni" *(below),* "Ballerina" and "Minnow"



PILOT who flew "Little Toni" in 1949 races was Bill Robinson *(left)*, talking to LeVier

. . . Cosmic Wind

(Continued from page 63)

designed for lightplanes: Cessnas, *Cubs*, Aeroncas and ships of that type. They usually red-line at 2550 or 2600 rpm. The first year we flew the midgets, we were a little worried about rpm's so we designed propellers to operate at 3200 rpm's. Now we turn a 60-inch prop up to 3800 rpm with alcohol fuel and have never had an engine go bad. The engine in my ship has over 100 hours on it—at least 80 per cent is over the rpm of the manufacturers warranty—and it runs as well now as it did when we took it out of the crate.

With an economy-minded Air Force, there might even be a place for little, low-cost ships of this type to train fighter pilots. Fuel consumption is low—about 8 gallons per hour at high rpm's—and the ship handles more like a jet job than anything else I've ever flown. The *Cosmic Wind* doesn't fly like a lightplane. It handles every bit like a high-performance aircraft. After all, when you get over 200 mph out of an 85-hp engine, that's good performance.

This ship might even be popular in the commercial field. Of course, any single-place airplane is difficult to sell because there aren't too many hermit-minded pilots. However, it has the performance and eye-appeal to make up for that loneliness. A commercial model would need several accessories: more instruments, a heater, modified pants for more clearance, a wider bubble canopy, more seat padding and a controllable-pitch propeller to avoid overspeeding the engine beyond the approved ATC maximums. The canopy is so narrow that I split my lip during the 1948 Cleveland race when I turned around to watch a ship that was following me and flew through a strong gust of wind.

With an ATC on the airplane, you could get rid of the parachute and give yourself even more cockpit room and a softer cushion. As long as the ship carries that "experimental" sign along the side of the cockpit, I'll follow the Good Book and keep my chute. I had to use one once back in Milwaukee, Wisconsin, when the wings folded up on the first test job I ever flew. The ship was a low-winged job with a Waco 9 fuselage, the lower wings from an old *Swallow*, the tail group from a Great Lakes and a *Cirrus* 4 engine.

With an experimental airplane, you're not allowed to fly over populated areas or over any crowd. You shouldn't fly over a crowd anyhow—in any airplane.

Top speed on the *Cosmic Wind* depends on the propeller. The regular racing props are built for fast acceleration and quick take-off. The reason for this fast "dig-out" is that most closed-course races are won in the first turn. The plane that gets there first can usually hold the inside of the pylon and should win on the short way around over a ship of equal speed. With these racing props, the ships will top just over 200 mph.

As it is now, the *Cosmic Winds* aren't the best bad-weather airplanes in the world. Ventilation at present consists of three one-quarter-inch holes drilled in the windshield just in front of your face. In wet weather most of the water blows around the bubble, but a little flies throngh these holes and hits you in the face with quite a sting. Then you hunt frantically for old matches to plug up the holes.

One flight coming back from San Diego, I ran through a little rain squall and ruined a wood racing propeller. There is no metal leading edge on a racing prop and five minutes in moderate rain peeled off all the fabric. Now we're using metal McCauley propellers and there's no such problem.

The *Cosmic Wind* is wonderful in the traffic pattern. You can slow them down to almost keep pace with the light trainers. I usually try to keep 90 mph through my base leg and then slow down to about 70 across the fence.

You should always check for the green light from the control tower just as you turn on your base leg and acknowledge by rocking your wings.

About the only thing that you have to watch for on a landing is to come down close enough to the ground before you start breaking your glide. You sit so much closer to the ground in the midget than in any other airplane that it almost feels as though the seat of your pants was dragging on the runway.

The *Cosmic Wind* is a funny deal on the actual landing. The ship comes in flat and if you drop it in even a foot, it will skip on its stiff gear and dribble a couple of times before it makes up its little mind to stay on the ground. Never attempt to make a wheel landing in this ship because there's a chance of stubbing your toe on the wheel pants or the prop. You have to be careful too of the brakes during the roll-out because of this scanty clearance. We have never had one groundloop.

Use of brakes on wet runways is something that even many experienced pilots don't understand. I learned about that while doing tests with the *Constellation*—and it applies just as well to the *Cosmic Wind* or a *Cub*. A good pilot can stop a "Connie" in 2,000 feet on a dry runway. Yet he can land on a wet strip, lock his brakes and slide for 10,000 feet. We proved it. So if you set this little racer down a wet runway, feather-foot the brakes so that the wheels don't lock and you'll stop in the least amount of runway.

The only trouble that I've had with this ship was on the ground. I got a ticket from a policeman one night while bringing the "Minnow" home from the Sportsman's Show at Gilmore Stadium in Hollywood. I had taken the ship to the show on a trailer and set up the wings after I arrived. When it came time to bring the plane home, it was 4 A.M., I was tired and there wasn't a car on the streets. So I hooked the tailskid to the back bumper of my car, hung a light on each wingtip and headed for home. I'd gone about a mile when a police car stopped me, gave me a ticket and made me take the wings off. With that stubby 16-foot wing span, I could have made it but the officer didn't think so.

That's just like the rest of this flying game. The most dangerous part of it is that doggone drive out to the airport!

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